PB-228 710

PROCEEDINGS OF NATIONAL SHELLFISH SANITATION WORKSHOP (5TH), NOVEMBER 17-19, 1964

Leroy S. Houser

Public Health Service
Washington, D. C.

November 1964

DISTRIBUTED BY:

NTIS

National Technical Information Service
U. S. DEPARTMENT OF COMMERCE
5285 Port Royal Road, Springfield Va. 22151

PB 228 710

PROCEEDINGS

5th NATIONAL SHELLFISH SANITATION WORKSHOP

November 17-19, 1964

Edited by

Leroy S. Houser

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Environmental Engineering and Food Protection
Shellfish Sanitation Branch
Washington, D. C. 20201

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

257

TABLE OF CONTENTS

Page
Foreword v
Agenda vi

Discussions

Opening Remarks 1
Industry Report on the Status of the Cooperative Program 1
PHS Report on the Status of the Cooperative Program 2
Report on Depuration -- The National Posture 2
Depuration in Florida 3
Depuration in Maine 3
Depuration in Massachusetts 4
Depuration in New York 4
Depuration in Rhode Island 5
Industry Report on Depuration 5
Relationship to Pollution Abatement 9
Advances in Oyster Culture 10
Coastal Surveillance and Security Control Radar 10
Current Administrative Problems of Cooperative Program Interim Procedures 11
Conference of State Sanitary Engineers Actions on Crabmeat and Scallops 14
Regulatory Problems on Non-Certified Imports 16
Report on Shellfish Imports 18
Report on Control of Sports Harvesting and Intrastate Sale 19
Bacteriological Criteria for Shellfish Growing Areas 21
Interim Bacteriological Criteria for Oysters 23
Initial Survey on Clostridium Botulinum Toxin, Type E 27
Heat-Shock Method of Preparation of Oysters for Shucking 27
Proposed Changes in Part I of the Manual 29
Proposed Changes in Part II of the Manual 36
Workshop Position on Depuration 43
Workshop Position on Cooling of Shucked Oysters 44
Continuation of Proposed Changes in Part II of the Manual 46
Workshop Resolution Pertaining to Pesticides 52
Review of Part III of the Manual 53

Appendices

Appendix A : Opening Statement by Mr. Harry Hanson, Assistant Surgeon General, Bureau of State Services 57

Appendix B : Industry Status Report (Elizabeth M. Wallace, Oyster Institute of North America) 59

Appendix C : PHS Report on the Status of the Cooperative Program (Frank J. Silva and Eugene T. Jensen, Shellfish Sanitation Branch) 61

Appendix D : Depuration - The National Posture (Eugene T. Jensen, Shellfish Sanitation Branch) 71

Appendix E : Present Status of Depuration in Florida (Larry Gillespie, Florida State Board of Conservation) 75

Appendix F : Depuration in Maine (Phillip L. Goggins, Maine Department of Sea and Shore Fisheries) 78

Appendix G : Status of Shellfish Depuration in Massachusetts (Mario M. Boschetti, Massachusetts State Department of Health) 93

Page

Appendix H : Status of Shellfish Depuration in New York (David H. Wallace, New York Department of Conservation) 97

Appendix I : Rhode Island Depuration Study (Manuel T. Canario, Department of Agriculture and Conservation, Providence, Rhode Island) 99

Appendix J : Industry Report on Depuration (Richard H. Loring, Aquacultural Research Corporation, Dennis, Mass.) .. 101

Appendix K : Pollution Control and Water Quality Objectives, (Wesley E. Gilbertson, Chief Division of Environmental Engineering and Food Protection) 104

Appendix L : Advances in Oyster Culture (David H. Wallace, New York State Conservation Department, Oakdale, New York) 110

Appendix M : Decca Coastal Surveillance and Security Control Radar as an Aid to Public Health and Conservation in the Shellfish Industry (Roy J. Mitchell, Decca Radar, Inc., New York, N.Y.) ...... (omitted) .. 113

Appendix N : Administrative and Management Problems in the National Shellfish Sanitation Program (Eugene T. Jensen, Shellfish Sanitation Branch) 122

Appendix O : Public Health Service Report to Joint Committee on Marine Food Sanitation (APHA-CSSE) of the Conference of State Sanitary Engineers an Evaluation of Need for Cooperative Certification Program for Scallops and Crabmeat (Leroy S. Houser, Shellfish Sanitation Branch) 127

Appendix P : Regulatory Problems on Non-Certified Imports of Shellfish (C. S. Brinsfield, Maryland State Department of Health) 132

Appendix Q : Shellfish Imports (William A. Felsing, Jr., Shellfish Sanitation Branch, San Francisco, California) 136

Appendix R : Control of Sports Harvesting and Intrastate Sale (Eugene T. Jensen, Shellfish Sanitation Branch) 140

Appendix S : Bacteriological Criteria for Shellfish Growing Areas (William J. Beck, Northwest Shellfish Sanitation Laboratory) 143

Appendix T : Interim Bacteriological Criteria for Oysters (C. B. Kelly, Shellfish Sanitation Branch) 155

Appendix U : Initial Survey on Clostridium Botulinum Toxin, Type E (Dr. Arthur F. Novak, Department of Food Science and Technology, Louisiana State Univ.) 164

Appendix V : Field and Laboratory Studies on Heat-Shock Method of Preparation of Oysters for Shucking (Somers B. Pringle, South Carolina State Board of Health)..... 165

Economic and Conservation Aspects of the Cooperative Study of the "Shock" Immersion or "Hot Dip" Process in Commercial Handling of Shellfish in South Carolina (Somers B. Pringle, South Carolina State Board of Health) 169

Page

Heat Shock Method of Preparation of Oysters for Shucking - Proposed Appendix D to Part II of Shellfish Sanitation Manual (Somers B. Pringle, South Carolina State Board of Health) 173

Appendix W : Foreword - A Declaration of Principles (Eugene T. Jensen, Shellfish Sanitation Branch) 177

Appendix X : Suggested Changes in the Manual of Recommended Practice for the Sanitary Control of the Shellfisn Industry (Leroy S. Houser, Shellfish Sanitation Branch)
Part I 179
Part II 183

Appendix Y : Time - Temperature Effect on Bacteriological Quality of Stored Oysters (C. B. Kelly, Shellfish Sanitation Branch) 193

Appendix Z : Suggested Changes for Part III - Public Health Service Appraisal of State Shellfish Sanitation Programs (William A. Felsing, Jr., Shellfish Sanitation Branch, San Francisco, California) 203

Appendix AA : Use of Chemicals on or Near Shellfish Growing Areas - An Industry Viewpoint (J. Richards Nelson, The F. Mansfield & Sons Co., New Haven, Connecticut) 212

Appendix BB : Industry Viewpoint of the Use of Chemicals on or Near Shellfish Growing Areas (George H. Vanderborgh, Jr., and G. Vanderborgh & Son, West Sayville, New York) 225

Appendix CC : Use of Chemicals on or Near Shellfish Growing Areas - The Public Health Service Viewpoint (Herman F. Kraybill, Ph.D., Bureau of State Services, Public Health Service) 226

Appendix DD : Attendance at 1964 Shellfish Sanitation Workshop... 231

FOREWORD

The 1964 Shellfish Sanitation Workshop was arranged by the Public Health Service in accordance with the recommendations of the 1961 Workshop. The objectives of the Workshop were: discuss current administrative and technical problems and to make necessary changes or revision in related Manuals. which [illegible] given in the report

Invitations to attend the Workshop were extended to all State and Territorial Health Departments, Marine Fishery Departments in the coastal States, Health Departments in major cities, interested Federal agencies, Governments of Canada, Japan, and Mexico, and the shellfish industry trade organizations. The Workshop was attended by 200 persons representing 99 agencies or organizations.

The following Proceedings are based on the prepared papers and a verbatim transcript. The Proceedings have been reviewed for accuracy by the various speakers.

Our appreciation is extended to the many persons whose efforts contributed to the success of this undertaking.

Eugene T. Jensen

Eugene T. Jensen, Chief
Shellfish Sanitation Branch
Division of Environmental Engineering
and Food Protection

AGENDA

FIFTH NATIONAL SHELLFISH SANITATION WORKSHOP

November 17-19, 1964

Auditorium, North HEW Bldg.
330 Independence Avenue, S.W.
Washington, D.C. 20201

Tuesday morning, November 17, 1964

CHAIRMAN: Mr. Wesley E. Gilbertson, Chief
Division of Environmental Engineering
and Food Protection
Public Health Service

9:00 Registration

9:15 Invocation

. . . Mr. William R. Woodfield
Woodfield Fish and Oyster Company

9:30 Opening Remarks

. . . Mr. Harry Hanson, Assistant Surgeon General
Associate Chief for Environmental Health
Public Health Service

10:00 Program Status Reports

Industry

. . . Mrs. Elizabeth M. Wallace
Oyster Institute of North America

Public Health Service

. . . Mr. James Silva
Shellfish Sanitation Branch
Public Health Service

10:45 Break

11:00 Depuration

The National Posture

. . . Mr. Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

Status Reports From States

Florida . . . Mr. Larry Gillespie
Salt Water Fisheries Division
Florida State Board of Conservation

Maine . . . Mr. Phillip Goggins
Maine Department of Sea and
Shore Fisheries

Massachusetts . . . Mr. Mario Boschetti
Massachusetts Department of
Public Health

New York . . . Mr. David H. Wallace
New York State Department of
Conservation

Rhode Island . . . Mr. Manual T. Canario
Rhode Island Department of
Agriculture and Conservation

Status Report From Industry

. . . Mr. Richard Loring
Aquaculture Research Corporation
Dennis, Massachusetts

Status Report From Public Health Service

. . . Mr. C. B. Kelly
Shellfish Sanitation Branch
Public Health Service

12:15 Lunch

Tuesday afternoon, November 17, 1964

CHAIRMAN: Mr. Dana Wallace
Marine Resources Scientist
Maine Department of Sea and Shore Fisheries

1:30 Pollution Control and Water Quality Objectives

. . . Mr. Wesley E. Gilbertson, Chief
Division of Environmental Engineering
and Food Protection
Public Health Service

2:15 Advances in Oyster Culture

. . . Mr. David H. Wallace
New York State Department of
Conservation

2:30 Decca Coastal Surveillance & Security Control Radar as an Automation Aid to Public Health & Conservation in the Shellfish Industry

. . . Mr. Roy J. Mitchell
Decca Radar, Inc.
New York, N. Y.

3:00 Break

3:15 Administrative and Management Problems in the National Shellfish Sanitation Program

. . . Mr. Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

Conference of State Sanitary Engineers' Actions on Crabmeat and Scallops

. . . Mr. Leroy S. Houser
Shellfish Sanitation Branch
Public Health Service

Regulatory Problems on Non-Certified Imports

. . . Mr. C. S. Brinsfield
Division of Food Control
Maryland State Department of Health

Imports

. . . Mr. William A. Felsing, Jr.
Shellfish Sanitation Branch
Public Health Service

5:00 Adjourn

6:30 Social Hour and Dinner

. . . U.S. Navy Commissioned Officers' Open Mess
Navy Yard Annex (Naval Gun Factory)

Wednesday morning, November 18, 1964

CHAIRMAN: Mr. John Trygg, Director
Division of Public Health Engineering
Louisiana State Board of Health

9:30 Control of Sport Harvesting and Intrastate Sale

. . . Mr. Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

10:15 Growing Area Bacteriological Standards

. . . Mr. William J. Beck
Shellfish Sanitation Branch
Public Health Service

11:00 Break

11:15 Interim Bacteriological Criteria for Oysters

. . . Mr. C. B. Kelly
Shellfish Sanitation Branch
Public Health Service

12:30 Lunch

Wednesday afternoon, November 18, 1964

CHAIRMAN: Mr. Robert Brown, Chief
Bureau of Environmental Hygiene
Maryland State Department of Health

1:15 Initial Survey on Clostridium Botulinum Toxin, Type E

. . . Dr. Arthur F. Novak
Department of Food Science & Technology
Louisiana State University

1:30 Study of Hot Dip Process

. . . Mr. Somers B. Pringle
South Carolina State Board of Health

2:15 Proposed Changes in Part I, Shellfish Sanitation Manual

. . . Mr. James Silva
Shellfish Sanitation Branch
Public Health Service

3:00 Break

3:15 Proposed Changes in Part I

. . . (continuation)

4:00 Proposed Changes in Part II, Shellfish Sanitation Manual

. . . Mr. Leroy S. Houser
Shellfish Sanitation Branch
Public Health Service

5:15 Adjourn

Thursday morning, November 19, 1964

CHAIRMAN: Mr. Ralph VanDerwerker
Regional Program Director
Region II - New York, N.Y.
Public Health Service

9:30 Proposed Changes in Part II

. . . (continuation)

10:30 Break

10:45 Proposed Changes in Part III, Shellfish Sanitation Manual

. . . Mr. Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

12:30 Lunch

Thursday afternoon, November 19, 1964

CHAIRMAN: Mr. Edward Gruble, Vice-President
Hilton Seafoods Company
Seattle, Washington

1:30 Use of Chemicals on or Near Shellfish Growing Areas

Industry Viewpoint

. . . Mr. J. Richards Nelson
F. Mansfield and Sons Company
New Haven, Connecticut

. . . Mr. George Vanderborgh, Jr.
Vanderborgh and Son
West Sayville, New York

Conservation Viewpoint

. . . Mr. Louis Stringer
Branch of Shellfisheries
Fish and Wildlife Service
U.S. Department of Interior

Public Health Service Viewpoint

. . . Dr. Milton Foter
Milk and Food Research
Public Health Service

2:30 Break

2:45 Status Report - Shellfish Sanitation Research Centers

. . . Mr. C. B. Kelly
Shellfish Sanitation Branch
Public Health Service

4:45 Adjourn

Tuesday Morning - November 17, 1964

Mr. Wesley E. Gilbertson, Chairman

The Workshop was convened in the auditorium, North HEW Building, Department of Health, Education, and Welfare, Washington, D. C., at 9:40 a.m. After an invocation by Mr. William R. Woodfield, President of the Woodfield Fish and Oyster Co., the Chairman introduced the initial speaker, Harry Hanson, Associate Chief for Environmental Health of the Public Health Service, Bureau of State Services. Mr. Hanson spoke for Dr. Robert J. Anderson, Chief of the Bureau.

Mr. Hanson welcomed the visitors on behalf of the Surgeon General and the Public Health Service to the Workshop and pointed out that the registration had at that time reached 160, and included representatives from Canada and Japan, indicating widespread interest in the program. He mentioned that 1964 is the 40th year of the operation of the Shellfish Sanitation Program, and said that the durability and soundness of the original program concepts were reflected in the long life of the program. Mr. Hanson discussed contemporary problems in shellfish sanitation and emphasized that the shellfish industry, the States, and the Public Health Service all have responsibilities in shellfish sanitation and that a breakdown or lapse on the part of any one of the participants jeopardizes the entire program. He further indicated that the Public Health Service should not be a party to the Voluntary Cooperative Program unless it was confident that there is a sincere and frank exchange of information with each State concerned, and that the exchange is on a fully cooperative basis. He also mentioned that the Department is on record with the Congress as declaring that the Shellfish Sanitation Program currently needs strengthening, and that through the Workshop, the technical or administrative changes needed in the program will be determined. The report to the Congress indicated the need for a National Register of Shellfish Growing Areas, he said, and stated that the Public Health Service hoped to have such a register fully operational in fiscal year 1965. In addition, he indicated in the report that there is a need for correlation of shellfish sanitation and pollution prevention abatement objectives, at both the State and the Federal levels, and that more effort is needed to assure that shellfish imported from other countries is equal in sanitary quality to that of the domestic product. (Mr. Harry Hanson's complete statement is included as Appendix A of these Proceedings.)

Industry Report on the Status of the Cooperative Program for the Certification of Interstate Shellfish Shippers

Mrs. Elizabeth Wallace, Director of the Oyster Institute of Northe America reviewed the present Cooperative Program from the standpoint of the shellfish industry. She indicated that industry members were present to deliberate with the various State agencies, and the Public Health Service to discuss current program needs of the molluscan industry, and to re-evaluate, modify, or change existing program to effectively resist program obsolescence. She indicated that the industry was concerned with the long-continuing and the recent precipitous decline in clam and oyster production and because demand exceeds supply the temptation to take these from uncertified waters, or to otherwise short-circuit regulations established to guarantee the safety of this food. Although supplies may be short during the 1964-65 season, she pointed out, advances in molluscan culture are promising, and the industry can here and now resolve to face current difficulties and prepare for a brighter future.

It was pointed out by Mrs. Wallace that the industry, with individual knowledge of the nearby waters and the habits of their neighbors, and as a partner with the State agencies, can forbid the market to the opportunist. She also suggested that the quality of producing waters should improve or the shellfish removed from such waters. It was indicated that the South Jersey Shellfisherman's Association has organized to do just these things through persuasion and political pressure on nearby municipalities so as to rectify local sources of contamination. Mrs. Wallace cited recent pollution problems in Maryland and said they had been resolved through the appointment by the Governor of an Expediting Committee made up of members from concerned State agencies and the shellfish industry which assisted in reevaluations leading to the reclaiming of approximately 70% of the aquatic resources. She indicated that the industry would insist that the needs of shellfisheries be included in comprehensive planning of uses of estuarine waters and that the industry would support the upgrading of water pollution control to a position of sufficient stature to insure good results. She pledged the industry to a course of action and responsibilities in cooperating with all official agencies so as to help make the Shellfish Sanitation Program successful. (Mrs. Wallace's complete statement is included as Appendix B of these Proceedings.)

PHS Report on the Status of the Cooperative Program for the Certification of Interstate Shellfish Shippers

The current status of the Cooperative Program for Certification of Interstate Shellfish Shippers was reviewed by Mr. James Silva, Chief of the Field Operations Section, Shellfish Sanitation Branch, Public Health Service. He pointed out that although the Program has administrative, financial, technical and legislative problems of varying proportion, it is a revitalized program at both the State and the Federal levels, and has improved Federal research resources, as well as many States carrying out research programs of their own.

It was indicated that for the fiscal years 1962, 1963, and 1964, the Public Health Service had used the program appraisal procedure, entitled Part III - "Public Health Service Appraisal of State Shellfish Sanitation Programs" in making State shellfish sanitation program evaluations. These appraisal procedures were given tentative acceptance by the 1961 Workshop. The use of Part III has brought about uniformity in State program evaluation procedures and has focussed attention on shellfish program components requiring attention and emphasis. Of the 23 States evaluated in FY 1964, 19 had final ratings greater than 70%. The highest rating was 100% and the lowest was 54.4%. The median value for all States was 84.8%. Eleven States had no program element rating less than 70%, four had one element less than 70%, five had two elements less than 70%, and two had three element ratings less than 70%. Caution in the interpretation of combined final State ratings was recommended as a combined rating greater than 70% could, and has contained within it, individual element ratings of less than 70%. It should be recalled that in a satisfactory program all elements must rate 70% or better. Overall, the appraisal procedure has been effective in describing areas of program need, both on a quantitative and qualitative basis. Tables of individual component values were presented, and are included in the complete paper in Appendix C.

During FY 1964, there were an average of 1,250 shellfish shippers listed each month on the Interstate Shellfish Shippers List. Twenty-two issues of this list were printed and were distributed to approximately 4,000 persons. Approximately 300 shucker-packers and repackers were inspected with the weighted sanitation ratings computed to be 87.1%. Approximately 100 shell stock shippers were inspected with an overall rating of 93.5%. Of 387 identified growing areas in the United States, approximately 349 were evaluated.

It was noted that since the 1961 Workshop there have been several disease outbreaks associated with the consumption of shellfish. In one of these outbreaks, several persons experienced symptoms resembling paralytic shellfish poisoning after consuming shellfish harvested from a non-polluted Gulf-State growing area. Subsequent investigation revealed that the suspect shellfish became toxic during an occurrence of Red Tide known to local fisherman, and that a new problem had arisen in the sanitary control of shellfish. The 1963-64 winter season saw approximately 250 cases of infectious hepatitis linked with the harvesting of shellfish from polluted waters.

Mr. Silva discussed the development of a National Register of Shellfish Growing Areas, the development of the depuration process, the seriousness of the pesticide contamination problem in shellfish growing areas, the presence of radionuclides in growing waters, the Quarterly Report of the Shellfish Sanitation Branch, program training needs, and Congressional hearings on problems of the shellfish industry. (Mr. Silva's complete paper is included as Appendix C of these Proceedings.)

Report on Depuration--The National Posture

Mr. Eugene Jensen, Chief, Shellfish Sanitation Branch, Public Health Service, presented a discussion of the status of the depuration process in the Cooperative Shellfish Sanitation Program. He pointed out that with increasing use of coastal areas the public confidence in preventing disease outbreaks from consumption of raw shellfish decreases.

It was pointed out that the Public Health Service is committed to the principle that shellfish must be as safe to eat as are other foods, and that since shellfish is not an essential food, consumers will not purchase shellfish if they believe there is a hazard. He suggested that if we are to keep on operating as we have in the past, i.e., with no change other than aggressive and coordinated support for pollution-prevention and abatement, we finally get to a point of no return where there will be no more areas to close, little industry, and a low confidence-factor on the part of consumers. Although a few areas might be "reserved" for shellfish culture, it is already too late for this because of the present degree of development as well as public and industry pressure for multiple-use of water areas. The use of a controlled system for shellfish production was not given, by him, much chance of success because of the current pressure for multiple use of estuarine areas.

It was explained that the depuration process seems to offer a partial solution to the problem of pollution of growing areas, since most coastal areas could then continue to be used for shellfish culture. Shellfish could also still be consumed raw; there would be no sweeping changes required in the industry; and the problem of wild or unprecedented growths in marginal restricted areas would be met.

Mr. Jensen recommended in his summary that the Workshop endorse the following concepts:

(1) That a satisfactory confidence factor is necessary to protect the health of shellfish consumers, and to assure continued acceptance of this food.

(2) That in many areas the problems of assuring continuous high sanitary quality of shellfish areas are such that it is becoming exceedingly difficult to maintain a satisfactory confidence-factor in shellfish.

(3) That the National Shellfish Sanitation Program be conducted at a level which will assure a satisfactory confidence-factor in shellfish as a food.

(4) That a continuing depuration research program be encouraged, as well as research in other techniques which would help to assure the high sanitary quality of shellfish.

(Mr. Jensen's complete paper is included in these Proceedings as Appendix D.)

Mr. Jensen also suggested that rather than proceed with a discussion of the various points in his paper, the Workshop proceed to listen to the other papers on depuration and then discuss the entire subject. The chairman indicated this procedure would give the participants a better chance to make judgments on the proposals.

Present Status of Depuration in Florida

A paper on "The Present Status of Depuration in Florida" was presented by Mr. Larry Gillespie, Salt Water Fisheries Division, Florida State Board of Conservation, Marine Laboratory, St. Petersburg, Florida. He indicated Florida has 8,000 miles of shoreline, a shellfish industry with an approximate economic production valued at from 1.5 to 2.0 million dollars annually, with the industry largely centered at Apalachicola. It was suggested that depuration could be a possible solution to the pollution problem in Florida. Mr. Gillespie described the depuration methods being tested by the Florida Board of Conservation Marine Laboratory in cooperation with Bay Seafoods, Inc., of Palmetto, Florida, on *Crassostrea virginica* and *Rangia cuneata*. It was reported that results were erratic and inconsistent due to problems of maintaining proper circulation and rate of water flow; removal of feces and waste products, temperature control, sanitizing the system before addition of shellfish, etc. It was indicated that tests are continuing with a small experimental pilot system. With this latter system, on two tests, water is coliform free after 4 hours, and oyster meats were below 800 coliform MPN per gram, after 12 hours on one test, and below 1,300 in 4 hours on another test. Future plans call for continuation of testing using the small pilot plant. It is further planned to build a commercial-size unit to continue testing. (Mr. Gillespie's complete statement is included in these Proceedings as Appendix E.)

Progress Report on Depuration in Maine

A "Progress Report on Depuration in Maine" was given by Mr. Phillip L. Goggins, Maine Department of Sea and Shore Fisheries. Mr. Goggins reported that in 1960, 46,958 acres of shellfish growing waters in Maine were closed because of pollution, and that further closures since have been catastrophic in effect to a number of coastal communities. It was indicated that although pollution abatement programs have been recently accelerated in Maine, such actions themselves can not provide conditions allowing the unrestricted taking of shellfish. However, these programs tied in with a controlled depuration scheme, would permit the use of a major part of currently restricted areas. Accordingly, studies were undertaken to determine the effect of environmental factors on depuration of soft shell clams.

Laboratory results, at temperatures between 16°C. and 20°C., indicate that purification was adversely affected with water flow rates less than 1.5 liter per bushel per minute probably because of oxygen-depletion which ranged between 70 and 90%. However, at a flow rate of 1.6-3.0 liter per bushel per minute, purification was not adversely affected, as oxygen depletion ranged between 35% and 70%. The cleansing of clams in single layers was compared with the cleansing of clams in multiple layers, with no adverse effect being demonstrated on the process on clams at various depths. No differences in purification rates (90% coliform and E. coli reduction) were demonstrated during 24 hour periods of depuration between a closed water system (water recirculated through the sterilizer) and an open water system (fresh estuary water passing through sterilizer). However, during the second 24-hour exposure period a 10-fold increase in coliform MPN, but not in E. coli MPN, developed in 43% of the runs in the closed syst. However, temperature in the open system varied between 11°C. and 11.5°C. while the temperature in the closed system remained at a room temperature of 18°C. It is postulated that the higher temperature accelerated the breakdown of the mucus of the feces releasing either previously immobilized bacteria, or caused bacterial growth in the slime formation on the tanks.

Mr. Goggins indicated that their experience in two commercial plants demonstrated MPN levels in soft clams can be much lower than the interim 78-230 fecal coliform standards for oysters, but that the initial load is very important. Clams with high initial loads do not reduce to the interim oyster standard in 24 hours. It is suggested that safe initial levels for 24-hour cleansing cycles and 48-hour cleansing cycles should be determined. It is pointed out that the pilot plant at Biddeford Pool was successful in cleansing clams and that a commercial operation at Sebasco Estates has been operating since August 1964.. Mr. Goggins used photographic slides in demonstrating the equipment and techniques used in the pilot plant. (Mr. Goggins complete report is included in these Proceedings as Appendix F.)

Status of Shellfish Depuration in Massachusetts

A statement, entitled "Status of Shellfish Depuration in Massachusetts" was presented by Mr. Mario Boschetti, Massachusetts Department of Public Health. Mr. Boschetti pointed out that depuration has been practiced in Massachusetts since the early 1930's in that a shellfish treatment plant for soft shell clams in Newburyport has been operating since that time. Soft clams treated at Newburyport are taken from moderately polluted areas in which the waters have a median coliform MPN of 700 or less. Chlorine has been used as the water sterilizing agent with the concentration kept below 0.5 parts per million. Recent work at Newburyport during 1962 and 1963 indicated that ultraviolet light was effective in reducing the coliform count of sea water to virtually zero even when starting with a water containing several thousand coliforms per hundred ml. It further indicated that soft clams allowed to feed in ultraviolet treated water showed a marked coliform decrease over that achieved with the use of chlorinated water.

Mr. Boschetti described the depuration process as presently used at the Newburyport plant and presented data on coliform density of untreated and treated clams. (Mr. Boschetti's complete presentation is included in these Proceedings as Appendix G.)

Status of Shellfish Depuration in New York

(Subsequent to the time the Agenda for the Workshop was prepared, the State of New York established a pilot depuration plant for hard clams. Mr. David Wallace, New York Department of Conservation, was therefore asked just prior to the opening of the Workshop if he would make a few remarks about the status of depuration in New York. Mr. Wallace graciously accepted the invitaion and spoke extemporaneously without benefit of the opportunity of prior preparation.)

Mr. Wallace indicated the State of New York with its large population, is one of the largest consumers of shellfish in the United States. Therefore, the State of New York has a very real interest in shellfish in relationship to the health of the consumer. New York also has an interest in that the State produces oysters, mussels, scallops, and clams. (New York State is the largest producer of hard clams.) For the above reasons he said, the State is very much interested in the shellfish sanitation program.

Mr. Wallace indicated that New York State currently has 600,000 acres of shellfish ground, 450,000 acres of which is open and 150,000 acres of which is closed because of pollution. Enforcement efforts to police the restricted areas are being accelerated at the State and county levels. This past year an aggressive program of relaying was launched and it will be greatly expanded in the coming years. New York also has a program in pollution control and abatement such that there may be opened next year a 40-square mile area which has been closed for the past 40 years.

It was stated by Mr. Wallace that it is unknown at the present time where depuration fits into the New York scene as not enough is known about depuration in relation to hard clams. A pilot depuration plant for hard clams is currently being set up in cooperation with local industry. It is currently felt that there are many problems in depuration of hard clams particularly in areas of varying water temperatures and where clams are forced to hibernate during the winter time. It was Mr. Wallace's view that purification is not a panacea for the shellfish industry. He suggested that a balanced program of relaying, pollution abatement, and policing of restricted areas, were still feasible control measures. It was also indicated that bootlogging is still possible around a purification plant and that this would nullify the depuration efforts. Mr. Wallace agreed with the previous speaker, Mr. Boschetti, that the variability of living animals precludes ideas that the depuration process may be compared to the process of pasteurization of milk or the purification of drinking water. (Mr. Wallace's complete statement is included in these Proceedings as Appendix H.)

Progress Report on Rhode Island Depuration Study

Mr. Manuel Canario, Rhode Island Department of Agriculture and Conservation presented a statement, entitled "Progress Report - Rhode Island Depuration Study". Mr. Canario indicated the shellfish industry of Rhode Island depends almost entirely upon the supplies of the hard clams, *Mercenaria mercenaria*, but that since 1955, when 5,020,000 pounds of quahaug meats were harvested, there has been a gradual decline in pounds harvested and diggers employed. Two major areas, the Providence River and Mount Hope Bay, are closed to shellfish harvesting due to pollution. It has been estimated that 600,000 bushels of hard clams are in the Providence River and 400,000 bushels in the Mount Hope Bay area.

Mr. Canario indicated that, in hopes that some of these quahaugs could be harvested and cleansed for market, the Rhode Island Division of Fish and Game has assembled a pilot size quahaug purification plant, and in cooperation with the Public Health Service is working on the development of techniques for the control and processing of depurated hard clams. He described the operation of the system and showed photographic slides. It was noted that at 22°C. *Mercenaria mercenaria* actively pumps for approximately 90% of the day, but with a drop to 5°C., activity decreases, and below 5°C. hibernation occurs. As water temperature rises above 75°F. quahaugs spawn causing coliform MPN's to increase. This problem was not encountered with the fecal coliform MPN'S. It is postulated that hard clams can be depurated in a 24 hour period since most fecal matter was found to have been expelled by the quahaug between the sixth and twentieth hour after entering the purification tanks. (Mr. Canario's complete report is included in these Proceedings as Appendix I.)

Industry Report on Depuration

Mr. Richard Loring, Aquaculture Research Corporation, Dennis, Massachusetts, presented a paper on "The Industry Report on Depuration". Mr. Loring indicated he was speaking for the Oyster Institute of North America which was the trade organization for the shellfish producers, processors, and distributors in the United States. It was pointed out that the Institutes membership has knowledge of the Public Health Service's position that there is further need to safeguard the public when they consume raw shellfish, and that this further safeguard should be in the form of depuration. Mr. Loring indicated the industry had been polled on the matter and their ideas had been correlated in his report.

Mr. Loring said it was the industries view that the present certification program can be accepted by all parties, the Federal agencies, State agencies and the industry--in principle. It was suggested, however, that the present program could meet the problem if it were properly implemented and that it would appear foolhardy to discard this concept when it had proved itself effective in all but a minute portion of the total industry. It was indicated that as far as is known, depuration will be prohibittively expensive and could conceivably put a large segment of the industry out of business. It was further indicated, however, that economic hardship should not be used as a factor for it should not exist where public health is concerned. It was stated that the present program does not resolve two major problems; (1) continual loss of certified areas; and (2) the continued temptation to exploit existing population of contaminated shellfish. With regard to problem (1) above, it was indicated the industry was doing all they could to strengthen the Federal anti-pollution laws and that the Public Health Service and other governmental agencies must do all they can. It was suggested that continued loss of clean shellfish areas may not be as true as in the past. An example, that Westchester County shore in New York State might be opened next year after being closed for forty years, was cited. It was stated that New York has not closed any major areas in the past two to three years, but that Maryland had closed 18,000 acres this past summer. Improved conditions will permit reopening all but 20% of this acreage in the near future. Mr. Loring further noted that relaying programs as pioneered by New York and Rhode Island proved to be sound and effective and that relaying constitutes the most positive action that can be taken at this time. It was also indicated that by relaying, the temptation to harvest shellfish from contaminated areas can be eliminated. It was noted that contaminated products which cannot be transplanted might be poisoned as a last resort.

Mr. Loring said that the depuration process has only been successful with soft clams, and that it is commercially feasible only because desanding takes place at the same time as depuration. He advocated a pilot depuration program be undertaken so that observations might be made of the results, and so that depuration may be properly evaluated under varying conditions of seasonal change and geographic location. He further pointed out that strict vigilance would still have to be maintained over contaminated areas because depuration, by creating a more expensive product, might encourage bootlegging. This process, like the certification program, is based on public confidence. Mr. Loring urged closer interagency communication and more effective cooperation as regards water surveillance and review. With regard to illegal harvesting, Mr. Loring recommended a central landing area for certification in conjunction with the existing program. Such an operation would check shellfish as it comes ashore at specific sites. An officer of the State could stamp the tags as approved upon rating the product. This would permit an easement in taking sanitary samples, and would lay the basis for some strigent laws that any shellfish not passing through these legally controlled points be subject to immediate confiscation. It was suggested a fee or tax could be placed on each bushel landed to help defray the additional cost and great mechanical problems which this sort of program would entail. It was further suggested that Federal funds be used--on a matching basis with the States--to help them improve their law enforcement and for technical assistance, as the States are unable to do the policing of the certification program without additional help. Another suggestion by Mr. Loring was that more stringent fines and jail sentences are needed to combat illegal harvesting. In summary, he proposed the following seven points:

1. The Public Health Service Certification Program can work.
2. Pollution control and abatement should be pushed harder.
3. Relaying programs should remove contaminated populations wherever possible.
4. That depuration be tested and researched.
5. Central landing areas for certification be established.
6. Drastic action be taken against persons caught removing shellfish from polluted areas.
7. Federal assistance be made available to the States in their policing programs.

(Mr. Loring's complete statement is included in these Proceedings as Appendix J.)

At the close of Mr Loring's paper, Mr. Gilbertson noted that having heard a variety of points of view on depuration, it might be in order to ask the participants if they wished to comment or to ask questions of those who had discussed the subject.

Mr. Schieferstein, Huntington, New York, Baymen's Association, said the cause of the problem should be attacked, and read the following prepared statement:

1. "All disposal plants should be periodically checked to see that they are running properly. People in charge should be fined and lose their jobs if caught being delinquent in their duties. Whenever possible, condemned areas should be opened up for winter harvesting under strict supervision. This would help eliminate illegal harvesting. Grossly polluted shellfish should be harvested and replanted in clean waters so that all shellfish could be utilized. With these two methods, heavy concentrations would be eliminated. The 'pirate' wouldn't have the 'big buck' to entice him into these areas.

2. "As this also involves interstate commerce, Federal laws should be made to fit the crime. The people illegally harvesting contaminated shellfish are potential killers and should be treated as such. Federal authorities could then be called in. All law enforcement bodies should be made acquainted with the seriousness of this offense. This does not just involve commercial men but also the mess digger that goes into these areas for shellfish. They can spread a disease the same as anybody else. As there are bathing beaches within these areas quite often people will catch shellfish at low tide, bring them home and distribute them to their neighbors. Depuration wouldn't stop this. It also will not stop the bootlegger of illegal shellfish. Depuration would be expensive. The whole market depends upon supply and demand. Industry would have to foot the bill for it. The bootlegger would counterfeit tags or seals to bypass this operation.

3. "Our food product will be important to future generations for survival. Disposing of waste in the water would be the cheapest and easiest way out but we can't afford to continue polluting our waters. If this is kept up you won't have a fish left that is fit to eat, or a beach fit to bathe in. Even today the world is depending more and more on the sea and its products. Witness the Russian and Japanese fleets fishing off our shores and overcrowded nations like India with their protein-deficient diets. What is going to happen when U.S. farms can't produce enough to feed the population? Let's start now to leave our future generations something decent to look forward to. Don't penalize the honest men who are trying to do a good job. Step up law enforcement at all levels! Envorce the law against the factories that are destroying our inland waters with their chemical waste and against the towns and cities which are not doing their job. Clamp down on the cause! Put the bootleggers of illegal shellfish behind bars, or better yet, hang them!! Then we will all have a better world to live in."

Mr. Bob Bower, representing the Pacific Oyster Growers Association and the Olympia Oyster Growers Association, said that his associations agreed with Mr. Wallace's and the Oyster Institute's position but that he would like to point out that the desirable multiple use of waters, if pursued, would require a depuration facility for each commercial shellfish producer. Further, that it is the responsibility of Federal and State governments to assist in the collection of any human sewage which is now or may in the future be detrimental to many uses of our public water system. Once collected, these discharges should be treated to an extent that they will no longer pose a public health problem. Such a program in a long range view would be by far the most economical and would be in accord with the National Creed which was adopted in 1960 which said: "Prevention of pollution is just as important as control."

Mr. George Harrison, representing the Chesapeake Seafood Industries Association, first congratulated Mr. Wallace and Mr. Loring for their statements, and then indicated that in listening to the speakers from Florida, Massachusetts, Maine, and Rhode Island, he felt each had proven a little more that we don't know enough about depuration. Mr. Harrison indicated that he believed we had no other course of action than to further study the problem and find out exactly where we are going.

There being no further discussion on the subject of depuration at this time, Mr. Gilbertson, as Chairman, recessed the meeting for lunch at 1:05 p.m.

(Note: Although the Agenda indicates that Mr. C. B. Kelly, Public Health Service, was to present a "Status Report on Depuration by the Public Health Service", the Workshop at this point was operating behind schedule, consequently Mr. Kelly's "Status Report" was rescheduled for the Thursday afternoon portion of the program.

Tuesday Afternoon - November 19, 1964
Mr. Dana Wallace, Chairman

The Tuesday afternoon session of the Workshop was called to order at 2:00 p.m. by the Chairman, Mr. Dana Wallace. Mr. Wallace pointed out that the program called for Mr. Ronald Green, Commissioner, Maine Department of Sea and Shore Fisheries, to be Chairman for this session. Unfortunately, Mr. Green was unable to be present so that Mr. Wallace substituted inasmuch as he represented the same organization.

Mr. Wallace indicated that, at the close of the morning session, there had been some discussion of the depuration process, and it was thought advisable to carry on a bit more with these discussions. He then called on Mr. Eugene Jensen.

Mr. Jensen said he had talked with several Workshop participants since the morning discussion, and in comparing his recommendations contained in his talk, (Depuration - The National Posture) with those of Mr. Loring and other individuals representing the industry, there seemed to be little argument between the two groups in principle, but there may be some disagreement as to "when". He proposed that the Workshop go on record as essentially endorsing the recommendations made by Mr. Loring as representing the shellfish industry. He then read the following as reworded from Mr. Loring's presentation:

1. That the Cooperative State-Industry Shellfish Certification Program can work.
2. That pollution control and abatement efforts should be pushed harder.
3. That relaying programs be used to remove contaminated shellfish populations wherever possible.
4. That depuration be tested and researched.
5. That central landing areas be established for certified shellfish wherever practical.
6. That drastic action be taken against persons moving shellfish from polluted areas.
7. That Federal assistance be made available to the State for their policing program.

An unidentified speaker suggested that No. 6 above be changed to say, "unauthorized persons removing shellfish from polluted areas." Mr. Jensen agreed to this proposal.

Another unidentified speaker pointed out that recommendation No. 5, above, may work in some States but not in Maryland. Mr. Jensen indicated it would be even more impractical in the State of Louisiana and for that reason we should add, "where practical," and that our record of these Proceedings will show that we do realize there are areas where this simply is something that we ought to do. There are places where it would work quite nicely and would add a substantial confidence factor to the program

Mr. George Allen, representing the Alabama Department of Conservation, indicated that, regarding the recommendations on Federal assistance, it would be found that most agencies do not want Federal assistance in carrying out their program of law enforcement. The problem he said, is not so much the apprehension of violations, but the failure to get convictions in court. If you can get a public relations program going--the judge is dependent upon his electorate--that will convince the public--that if dealing in illegal shellfish is as violent and heinous a crime as we like to think it is, you will be giving the enforcement agencies the most assistance that you can give them. However, as far as having Federal help in enforcing it, "no thank you."

Mr. Gilbertson raised the question of Federal aid in policing areas as he personally objected to the word "policing" and wondered if it is what was really intended. Mr. Jensen said he viewed "policing" as marine patrol.

Mr. Loring said he did not want to say they wanted Federal officers patrolling State areas but they were thinking primarily of financial assistance to improve policing methods such as radar techniques, faster boats, etc. Further, he did not want to infer that the industry wanted Federal officials patrolling the areas.

After some further discussion as to the need for Federal assistance in No. 5, it was Mr. Jensen's suggestion that he and Mr. Loring get together that evening and attempt to resolve the wording of items 5 and 7. This arrangement was agreed to by the Workshop participants.

Relationship to Pollution Abatement

Mr. Wesley E. Gilbertson, Chief, Division of Environmental Engineering and Food Protection presented a paper, "Pollution Control and Water Quality Objectives". In his talk Mr. Gilbertson stressed the absolute need for maintaining satisfactory sanitary quality at all times in those areas from which shellfish are harvested and prepared for market, and traced the histroy of the shellfish sanitation program in periods of pre-sewers, sewers, sewers plus rapid population growth, and sewers plus treatment plants plus population growth.

Mr. Gilbertson noted several sources of possible contamination of shellfish growing areas in addition to effluent from sewage treatment plants. These were wash-off from cities after rains, run-off from agricultural areas and forests, sewage disposal from commercial and pleasure boats. It was suggested that corrective devices for disposal of wastes from pleasure craft should be required by State or Federal law. It was indicated that a new section was added to the Interstate Quarantine Regulations in August of 1960 which restricts the discharge of sewage, ballast or bilge water from vessels within a three-mile radius of some 150 potable public water supply intakes in the Great Lakes. It was further noted that the Public Health Service in 1960 established an Interdepartmental Committee on Sewage and Waste Disposal from vessels concerned with sewage discharges in local harbors, the intercoastal waterways, and the inland rivers. The Committee has met five times and has arrived at a recommendation that all new vessels, or vessels undergoing major conversion subject to the regulations should be provided with sewage treatment or retention facilities. The regulations are being amended at this time to encompass the recommendations and will become effective in early 1965.

Concern with the chemical wastes, which includes radioactive materials, pesticides, and waste chemicals from industry, was expressed. It was pointed out that we have entered a new and more complicated period in that shellfish growing water criteria can no longer be defined solely in terms of microbiological parameters.

It was indicated that the shellfish industry now seems fully aware that pollution is the major problem facing it and that the Division of Environmental Engineering and Food Protection has given a great deal of thought to the problem and has held numerous conferences on the subject with the Division of Water Supply and Pollution Control and the Division of Radiological Health. As a result of these conferences and past experience, Mr. Gilbertson suggested the following:

1. We need to formulate precise definitions of water quality criteria, including those elements of sewage system design which will determine the effectiveness of the system in terms of water quality objectives, as related to shellfish needs.

2. We need to make a determined effort to see that water pollution control agencies and design engineers understand the water quality criteria of the shellfish program.

3. We need to see that the water quality needs of the shellfish program receive proper recognition in long range water pollution control planning or water resource planning.

4. We need to support and encourage programs for the prevention and abatement of pollution.

5. We need to support programs at the State and Federal levels which will insure that waste treatment plants are operated in accordance with the designed goals of the shellfish programs--and we do not feel that the agency responsible for the shellfish program should take the word of another agency (State or Federal) that these plants are, in fact, operated effectively. The shellfish control agency must necessarily have a "show me" attitude, although we recognize that it is not the responsibility of the latter group to oversee the operation of treatment plants.

Mr. Gilbertson also discussed depuration. In general, it was his view that the Public Health Service technical goal should be to require all shellfish which might be consumed raw to be submitted to such a process before marketing. It constitutes a consumer-protective device, he said, which seems to be the only feasible way to maintain a satisfactory confidence factor in the Cooperative Program. (Mr. Gilbertson's complete paper is included as Appendix K).

Advances in Oyster Culture

Mr. David Wallace, Director of Marine Fisheries, State of New York Conservation Department, using photographic slides, presented a paper on "Advances in Oyster Culture". Mr. Wallace indicated that there had been a gradual decline in oyster production along the entire east coast of the United States starting in 1900. This has caused industry and State conservation agencies to evaluate their conservation practices and to conclude that new techniques of oyster culture must be developed and perfected. One problem has been lack of production of seed oysters; however, new seed-growing techniques developed in the last five years show great promise. Early previous investigators suggested the use of salt ponds for seed production. Recently, commercial production of seed on culch suspended above the bottom has progressed rapidly in a salt pond at Fishers Island, New York. In this pond the Ocean Pond Corporation has scallop and oyster shells strung on wires and hung beneath styrofoam rafts while the larvae are in the free-swimming state. They have collected sets averaging fifteen spat per shell. The first commercial high-count seed (3,000-5,000 per bushel) was sold to Connecticut and New York oyster farmers in 1963. Using the same method in 1964, they have sold the entire crop of 7,500 bushels. This success has stimulated other efforts as the demand for seed exceeds the supply in New England. The New York State Conservation Department, working with the town of Southampton and local baymen has produced substantial quantities of seed this summer in a salt pond called Mecox Bay. Salinity in this pond is maintained at the appropriate level by opening or closing the ocean barrier beach. The pond is kept closed when the larvae are in the water. It is estimated that at least ten ponds suitable for growing seed commercially exist in New England. If each produced 5,000 bushels per year, a good start would be made toward a solution of the seed problem.

Another method is in a commercial hatchery technique developed through studies at the U.S. Fisheries Laboratory at Milford, Connecticut, and later pursued in studies by Mr. Joseph Glancy of West Sayville, New York. Three seed hatcheries using the Glancy method operated during the summer of 1964. The method was pioneered by the Bluepoints Company who have used it to produce several thousand bushels of seed annually for the past five years. The hatchery technique holds great promise for the future.

Mr. Wallace predicted that ultimately we will be able to produce seed under completely controlled conditions, be able to eliminate diseases and predators, reduce materially the time between spawning and marketing mature oysters, and produce a "fat" product free of pathogens. (Mr. Wallace's complete paper is included in these Proceedings as Appendix L.)

Coastal Surveillance & Security Control Radar as an Automation Aid to Public Health & Conservation in the Shellfish Industry

Mr. Roy J. Mitchell, Executive Vice President, Decca Radar, Inc., gave a talk entitled "Decca Coastal Surveillance and Security Control Radar as an Automation Aid to Public Health and Conservation in the Shellfish Industry". Mr. Mitchell defined radar as a radio eye without a human short-range capacity for detail, but with many other advantages, especially over longer distances and in conditions of poor visibility. It was said radar can automatically, simultaneously, and continuously, survey an area and present the result centrally, as one complete, readily intelligible picture.

Mr. Mitchell, in explaining what radar automation can do in shellfish area surveillance assumed that most areas requiring surveillance would be a few miles in radius, and that all surface objects both fixed and moving were to be kept under constant observation. Foreign objects or intruders would be immediately apparent. Identification would be achieved by means of observer familiarity with the scene and by target behavior. Principal concern must be with the range of viewing and the power to resolve detail. It was indicated that microwave radar cannot penetrate solid obstructions and that there must be an unobstructed view between the radar antenna and all parts of the surface to be observed. As an approximation, he said, an antenna at 15 feet above sea level can "see" about 5 miles while a height of 50 feet is necessary to view a ten mile radius. Applications of radar installations to the shellfish industry surveillance problem were listed as: (a) the prevention of illegal shellfish gathering in polluted waters; (b) in combatting poaching on commercial beds, and (c) in deployment of harvesting crews on shellfish operations. He indicated that no special operator skill is required to handle a modern commercial radar installation. (Mr. Mitchell's complete presentation, together with material handed out at the Workshop is included in these Proceedings as Appendix M.)

Current Administrative Problems of Cooperative Program-Interim Procedures

Mr. Eugene Jensen, Chief, Shellfish Sanitation Branch, PHS, presented a discussion entitled "Administrative and Management Problems in the National Shellfish Sanitation Program". Mr. Jensen outlined the history of the Cooperative Program with regard to management procedures and indicated that the overall National program would probably be strengthened materially by better defined management procedures. Mr. Jensen made the following proposals:

1. Recommend that the Public Health Service give strong consideration to the establishment of a senior advisory committee. The committee would not be a decision-making body but would advise the Public Health Service on overall administration of the program, help plan National Workshops, and help coordinate the National and Regional meetings.

2. Give official recognition to the relationship between the Regional and National meetings and endorse the concept that program changes will be made through the mechanism of National Workshops and associated Regional meetings. The National meetings would be scheduled in Washington in the late fall at two or three year intervals.

3. Request that the Public Health Service prepare an operational manual to define the procedures to be used in making changes in the National program. The proposed manual should be discussed with State agencies and other interested parties and brought before the next Workshop for consideration.

4. Recommend that the Public Health Service investigate the possibility of using the PHS lists of State certified shippers to inform industry of National meetings and of significant changes to be made in the program. This would help avoid the charge that many industry members are poorly acquainted with their role in the Cooperative Program and that technical changes are made without their knowledge.

Mr. Woodfield (Woodfield Fish and Oyster Company) suggested not having the Workshops in the late fall as this handicaps industry attendance because it is so close to the busy Thanksgiving season. Mr. H.R. Bassett, Chesapeake Seafood Packers Association, indicated that it would be more convenient for industry, and that industry could have more representatives present at future Workshops, if they were held in May or June, rather than in November. Mr. Bassett then made a motion that all future National Shellfish Sanitation Workshops or meetings called by the Public Health Service be held during the months of May or June.

Mr. Bower representing the Pacific Oyster Growers Association and the Olympia Oyster Association related that he was specifically instructed by the Presidents of both Associations to express the same view that this is the busiest time in the oyster season and there might be others who would have attended had it been held at another time. Mr. Bower further suggested that someday it might be possible to hold it closer to the West Coast as it worked a hardship on people from the West Coast to get to Washington, D.C.

Mr. Jensen then discussed the conduct of National Shellfish Sanitation Workshops. It was explained that it had been PHS experience that any changes in Cooperative Program standards are best made through application of "law of the situation" rather than compromise or majority rule. This has the effect of each of the major participants having a veto power. Mr. Jensen indicated a more formal approach could be adopted for future meetings but it would raise many questions as to the "rights" of the various program participants and of the "authority" of the State and industry representatives to commit their agencies to a course of action. These problems are avoided by the "law of the situation" as long as all parties show a reasonable degree of cooperation. Questions arise as to the type and number of industry representatives, particularly from those few States in which the primary trade associations (The Oyster Institute of North America and its affiliated associations) are poorly represented. While these problems have been discussed in varying degrees with the States and industry at meetings proceeding this Workshop, no one has come up with concrete suggestions for improvement even though everyone has admitted certain problems exist. Mr. Jensen stated no immediate changes were proposed in our method of conducting the Workshop but that we will expect to have formal proposals which can be submitted to the States at the next series of regional meetings at which time PHS central office staff will be prepared to interpret and explain our proposals.

Mr. George Harrison, Chesapeake Bay Seafood Industries Association, Inc., moved that the following procedure be placed in effect, and be so used until changed or amended by unanimous action (vote) of those parties hereafter recognized:

A. "That all registrants at this and future National Shellfish Sanitation Workshops, and like or similiarly purposed conferences, meetings, forums, or gatherings, be classified into one of four categories as follows:

1. U.S.P.H.S. Representatives - Employees or selected Bona Fide Representatives of the U.S.P.H.S. or the Department of Health, Education and Welfare.

2. Members of the Health Departments (or Control Agencies) of the Several States - Employees or selected Bona Fide Representatives of the respective Health Departments of the Several States. In the case where the Health Department of a State is not the complete control Agency, with regards to Public Health Regulations and the Shellfish Industry, then that State would be represented by both it's Health Department and the assisting Agency of ths State.

3. Members of the Shellfish Industry - Owners of, and/or their Bona Fide Representatives, of any company shown on the most recent list of Certified Shippers (Classified either as a Reshipper, Repacker, Shell-Stock Shipper, or Shucker-Packer); and any Executive of any recognized Trade Association, representing the Shellfish Industry either on a local, State-wide, regional or National basis.

4. Guests--Any person present, who does not fall into either group previously stated (Reporters, Wives, Foreign Observers, etc.).

B. That each of the first three categories or classifications be given one vote each! Also, that upon each question presented before such workshops, conferences, gatherings, meetings or similiarly purposed forums, this vote be so recorded in the records or proceedings.

C. For the vote to be cast by the Health Departments (or Control Agencies) of the Several States (Those attendees falling into category A-2), each State present would be allowed to cast one ballot in the caucus to determine the overall vote cast by the group.

D. For the vote to be cast by the Industry (Companies or Associations present) (Those attendees falling into Category A-3), no company or Trade Association shall be allowed more than one vote each to be registered in their caucus to determine how the one vote for the total category shall be cast."

In response Mr. Jensen indicated that under the above proposal Mr. Louis Stringer of the Bureau of Commercial Fisheries would be classed as a guest. The proposal would also raise some questions in terms of international representation.

Mr. Jensen explained that we had tried to avoid voting in the past and that we have to avoid voting at the present time until some sort of rules are established and that currently there is no way in which one can make a resolution and have it voted on. It almost has to be a situation approach in which the proposals are more or less, agreeable to all participants. Mr. Jensen stated that as an example of what could happen in connection with voting, not everyone would want to see the resolution adopted which required that all shellfish be landed at specific points. It might well have ended with one or two States being in the minority and yet, being a State would not necessarily have to be guided by the voting. The result might be a situation where the vote would be meaningless. Further, it appears that for the present it would be better to seek positions that are mutually acceptable as all must realize that all participants have a real interest in making the program work effectively. It was further pointed out that legal responsibility for shellfish sanitation programs in each State rests with the State and not the with the Federal Government.

After some further discussion of Mr. Harrison's proposals, it was agreed by both he and Mr. Jensen, that the proposals should be circulated to the States for study, in hopes that a better method of voting at Workshops may be arrived at.

Mr. Jensen next brought up the question of the program name. It was explained that the present name on Manuals is "Cooperative Program for the Certification of Interstate Shellfish Shippers" which is long and somewhat cumbersome. The Workshop participants were asked whether it would be agreeable to them if the present name be shortened to something like "The National Shellfish Sanitation Program". Mr. Jensen indicated that since no objection was expressed from the participants, the proposal was considered accepted.

Mr. Jensen brought up the subject of the proposal by industry that the Public Health Service listing of State certified shippers should include the percentage sanitation rating for each plant listed. Mr. Jensen observed that the Public Health Service could see a great many disadvantages to such a system. Two of these disadvantages he pointed out. One, was that it would be a difficult task to continually be revising the list on almost an every two week basis to reflect the new sanitation ratings. The second was that it would put the State under a lot of pressure to be continually making additional inspections in order to get new ratings. Also, buyers would tend to buy only from the plants with the highest ratings, and would tend to make a distinction between plants with insignificant rating differences. Mr. Jensen indicated that the Public Health Service recommended no changes in the present system. There being no comment or suggestion on this from Workshop participants, Mr. Jensen indicated that no change would be made in the certification list.

Mr. Jensen next discussed the need for more adequate financing of State shellfish sanitation programs. It was indicated that the States need at least two million dollars a year to carry out adequate programs. Mr. Jensen mentioned that although administrators, such as Mr. Trygg of Louisiana, may be personally interested in shellfish sanitation, they have numerous other programs which need money and more staff. He further indicated that, testifying before the House Molluskan Hearings in 1963, the Conference of State Sanitary Engineers was cited as mentioning the problem to the Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries. In addition, the Association of State and Territorial Health Officers two years ago raised the question of use of Federal funds, either through grants or contracts, to strengthen State programs. Mr. Jensen indicated he had no specific progress to report in this area and no specific suggestions except that the Public Health Service was convinced this constitutes a very significant administrative problem which in one way or another will have to be resolved. Mr. Jensen then indicated he would be pleased to have the record of the Proceedings show recommendations or course of action prescribed. There was no response from the Workshop participants.

Mr. Jensen next discussed the question of interim decisions (policy questions or actions between Workshops) and how best they might be handled. He pointed out that the Public Health Service is sometimes accused of making such decisions unilaterally and at times the Public Health Service almost has to do this. He reported that when an incident which requires program action occurs he tries to get in touch with Mr. Trygg, as Chairman of the Marine Foods Committee of the Conference of Sanitary Engineers, and with Mrs. Wallace, representing the shellfish industry, to work out a course of action that can stand until the Workshop as a whole has the opportunity to consider the problem and make changes deemed necessary. Mr. Jensen stated that some procedure for handling interim changes is necessary and that it was an area in which an advisory committee with a built-in executive committee might be quite helpful. He requested whether anyone had any particular views on this matter. There was no response.

Mr. Jensen next discussed the matter of a State Plan Review as criteria for State participation in the Certification Program. He pointed out that the current system for evaluation and endorsement of State programs by the Public Health Service is essentially retrospective. Mr. Jensen recommended prior PHS evaluation of the "State Plan" as a prerequisite for State participation in the National Program. Under such a scheme, each State would be expected to submit to the PHS a plan for the next fiscal year for carrying out their responsibilities under the National Program. If the critical review of this plan by the PHS staff disclosed that the State would be unlikely to carry out a satisfactory program, the Public Health Service would so advise the State. The State would have three courses of action open to them: one, a technical appeal which might be based on the State's contention that their plan would in fact be effective; second, assignment of additional resources or perhaps technical restructuring to make the plan effective and in accordance with the National Program goals; third, to agree that their plan would not be effective and, therefore, they would not participate in the program. This positive approach would improve consumer confidence factors, should minimize friction between the Public Health Service and the State agencies, and should help focus attention on the need for a State agency budget. Mr. Jensen stressed that he was making no proposal for adaption immediately but was proposing that it be discussed with a couple of States to determine if they might be willing to try it with us for a year or two and see how it might work. He then asked for the State views.

Mr. Hobbs, Maryland State Health Department, indicated he could see advantages to a State plan where a State might be falling below a certain level, but that if the State has to prepare a series of plans and complicated reports which the State would send to the Public Health Service or local agencies, he could'nt see the necessity for such an arrangement.

Mr. Howell, Delaware State Health Department, indicated Delaware would tend to go along with the proposal.

Mr. Trygg, Louisiana, inquired if the States did not already have to submit plans in connection with grants received from the Public Health Service.

Mr. Jensen replied this was correct, but that these plans were not specific and did not include conservation agencies.

Mr. Willerford, Connecticut State Health Department, indicated the proposal would work quite a hardship on his State as they are currently having difficulty keeping up with present requirements.

The Workshop did not reach a decisive decision on this subject, however, no objection was expressed to trying it out if one or more States agreed to it on a trial basis. (Mr. Jensens complete paper is included in these Proceedings as Appendix N.)

Conference of State Sanitary Engineers' Actions on Crabmeat and Scallops:

Mr. Leroy S. Houser, Public Health Service, presented and discussed the following proposal on Crabmeat Picking Plants:

CRABMEAT PICKING PLANTS

At the Conference of State Sanitary Engineers meeting May 22-24, 1962, the Joint Committee on Marine Food Sanitation concluded "that there was a need for a 'cooperative certification' program for scallops and that such a program might also be desirable for crabmeat." The Committee requested that the Public Health Service evaluate the needs for programs in these two areas, and prepare a report to CSSE on their findings.

Attached is a copy (Appendix O) of the PHS REPORT TO JOINT COMMITTEE ON MARINE FOOD SANITATION (APHA-CSSE) OF THE CONFERENCE OF STATE SANITARY ENGINEERS ON EVALUATION OF NEED FOR COOPERATIVE CERTIFICATION PROGRAM FOR SCALLOPS AND CRABMEAT. The Conference of State Sanitary Engineers unanimously accepted this report during their subsequent meeting on June 25, 1963. Although acceptance of the report on crabmeat tables the proposal for a certification program, such acceptance did not clearly indicate whether the CSSE believed it desirable (See page 130, Appendix O) for the Shellfish Sanitation Branch to prepare Sanitary Recommendations for Crabmeat Picking Plants for voluntary adoption as the States may see fit. Accordingly, the following proposal is submitted to the Workshop for decision:

Proposal 1. That the Shellfish Sanitation Branch prepare Sanitary Recommendations for Crabmeat Picking Plants for voluntary adoption by the States.

Discussion: From the limited data available to the Shellfish Sanitation Branch, there does not appear to be a serious public health problem in connection with crabmeat picking plants. Further, the principal crabmeat producing States appear to have adequate sanitary regulations and no State has indicated any major problem exists in regard to imports or exports.

Recommendation: It is recommended that the Workshop, in the absence of a clearly identified public health problem in connection with the sale and distribution of crabmeat, go on record as not recommending at this time the preparation of sanitary recommendations concerning the crabmeat industry by the Shellfish Sanitation Branch.

Workshop Action: Without discussion the Workshop went on record as accepting the above Recommendation on Crabmeat Packing Plants.

After acceptance of the above by the Workshop, Mr. Houser presented and discussed the following proposal on Scallops.

SCALLOPS

In the attached copy (Appendix O) of the REPORT TO JOINT COMMITTEE ON MARINE FOOD SANITATION (APHA-CSSE) OF THE CONFERENCE OF STATE SANITARY ENGINEERS ON EVALUATION OF NEED FOR COOPERATIVE CERTIFICATION PROGRAM FOR SCALLOPS AND CRABMEAT it will be noted that it was our recommendation to the CSSE (which was accepted) that we take up the matter of including scallops in the present Cooperative Program for the Certification of Interstate Shellfish Shippers with the 1964 Workshop.

Proposal 2. That scallops be included in the definition of "Shellfish" in Parts I and II of the Shellfish Sanitation Manual.

Discussion: As indicated in the above report to the CSSE, scallops were included in the original 1925 Report of Committee on Sanitary Control of the Shellfish Industry but were not included in the Manual requirements after 1937, probably because the viscera is discarded in the shucking process, the meat is not generally consumed raw, and the animal is a free-swimming organism. While we have no specific objection to the inclusion of scallops in the definition again, it should be pointed out that possibly the growing water standard (median coliform MPN less than 70/100 ml) should be waived since the animal is free-swimming, the viscera is discarded in the shucking process, and scallops are not generally eaten raw. Also, we believe it would be advisable to waive the requirement of separation of the packing operation from the shucking operation as the majority of scallops are shucked on sea-going vessels.

Recommendation: Although we believe there is need for a sanitation program for scallops as well as for all fishery products, we do not at this time have convincing evidence that there is justification for inclusion of scallops in the definitions of shellfish in Parts I and II of the Manual. We therefore recommend against the adoption of this proposal by the Workshop.

Workshop Action: Without discussion, the Workshop went on record as accepting the above Recommendation on Scallops.

(The PHS Report to Joint Committee on Marine Food Sanitation (APHA-CSSE) of The Conference of State Sanitary Engineers on Evaluation of Need for Cooperative Certification Program for Scallops and Crabmeat is included in these Proceedings as Appendix O).

Report on Regulatory Problems on Non-Certified Imports of Shellfish:

Mr. C. S. Brinsfield, Chief, Division of Food Control, Maryland State Department of Health presented a report on Regulatory Problems on Non-Certified Imports. Mr. Brinsfield indicated that before starting on his prepared paper he would like to make one statement. This was to the effect that no cases of hepatitis had ever been attributed to Maryland shellfish. Mr. Brinsfield went on to say that some growing areas in Maryland were not opened when their 1964-65 season began on September 1, pending results of their double-check to make certain that these growing areas were satisfactory. As of the time he was speaking Mr. Brinsfield indicated 80% of Maryland's growing areas were open and that this percentage would increase as they continued their double-checking. He further indicated Maryland for several years had been suggesting that numerical shellfish ratings of individual plants be published on the Public Health Service certification list.

With regard to Regulatory Problems on Non-Certified Imports of shellfish, Mr. Brinsfield indicated that on learning from Mr. Jensen that there was the possibility of non-certified oysters from outside the U.S.A. being imported into Maryland, he was shocked to learn the Public Health Service had no control over imported shellfish under the Cooperative Shellfish Sanitation Program. Mr. Brinsfield learned it was the duty of the U. S. Food and Drug Administration to sample imported oysters unless they came in under the Cooperative Program. Mr. Brinsfield indicated he visited the Food and Drug Administration concerning the problem and was informed their laws only provided for an objective examination, that several seizures had been made at border custom points, that some shipments had passed FDA objective examinations, and that FDA records show they sample approximately 1% of the foods entering the United States.

Mr. Brinsfield said he then held a series of conferences with the segment of the U. S. industry planning to use the imports and it was stated that the company in question would consider them unfit for sale in any of their stores in the U.S. if not good enough for sale in Maryland. This example was used by Mr. Brinsfield as indicating that the vast majority of industry members will cooperate if properly informed of the quality of foods they are buying and selling. Mr. Brinsfield also cited the example of his action informing adjacent States about the problem which ultimately led to seizure of imported oysters, and stressed the importance of cooperation among States on such matters. Mr. Brinsfield pointed out that probably neither the PHS nor FDA could keep out oysters to which had been added monosodium glutamate and other seasoning by calling the product oyster stew. Although such products would be subject to FDA objective examination, they would not be subject to control under the Cooperative Program. It was stressed that States receiving shellfish should possess information relative to the growing area, harvesting practices, in-plant protocol inclusive of sanitation, in-transit handling, etc. It was further pointed out that objective examinations do not ordinarly detect-toxigenic strains, staphylococci, hepatitis virus, or deteriation caused by enzyme reactions.

Mr. Brinsfield quoted from a law which the Maryland legislature had passed, and which took effect June 1, 1964, as the method Maryland had used to control the problem of imports. In essence the Maryland law (refer to Appendix P for details, on the law) prohibits the importation into the State of shellfish from sources that have not been certified for interstate shipment through the U. S. Public Health Service. Mr. Brinsfield pointed out that the Maryland law covers all types of shellfish rather than only raw or frozen shellfish. Mr. Brinsfield also described what Maryland is doing in connection with "oyster roasts" where raw shellfish are served on the half shell. (Mr. Brinsfield's statement is included as Appendix P of these Proceedings.)

Mr. Richard Howell, Delaware Department of Health, commented that Delaware had a similar problem on imports from a foreign country and had solved it by regulation rather than by a change in the law. He also pointed out that although neither PHS or FDA controlled imports the actual legal basis for all food programs rests with the States. He said the States should recognize the problem and take adequate steps.

Mr. Brinsfield proposed* that the Workshop consider inclusion of all edible types of shellfish and or portions of shellfish under the National Shellfish Sanitation Program

---

* Mr. Brinsfield's proposal and the subsequent discussion actually took place at the Thursday afternoon session (Nov. 19, 1964) but is inserted at this point of the Proceedings for reasons of continuity.

instead of the present restriction to raw and frozen shellfish, regardless of whether mixed with seasoning or other food ingredients. He explained the above by saying it should be clearly understood that the certification shall not apply to the seasoning or other food ingredients but would only apply to the oyster, clam, or mussel or segments thereof that would be in the final product. Mr. Brinsfield further requested that the Public Health Service consult with the Food and Drug Administration regarding the practicability of labeling such foods to indicate that the shellfish in it were produced and processed under the sanitation requirements of the National Shellfish Sanitation Program.

WORKSHOP PROPOSAL

By

Mr. Carroll Brinsfield
Maryland State Dept. of Health

Proposal:	That all edible types of oysters, clams, or mussels and--or portions of these species be included in the Cooperative Program for the Certification of Interstate Shellfish Shippers, regardless of whether mixed with seasoning or other food ingredients; provided however, that Cooperative Program requirements would not apply to the seasoning or other food ingredients, but only to the oysters, clams, or mussels, or to segments thereof as used in the final product itself, and; that the Public Health Service consult with the Food and Drug Administration regarding the practicality of labeling such foods to indicate that the shellfish contained therein were produced and processed under the sanitation requirements of the National Shellfish Sanitation Program.
Action:	After discussion by Workshop participants in which it was reaffirmed that the proposal did not pertain to ingredients such as "breeding materials," but only to shellfish meats, the Workshop unaminously adopted Mr. Brinsfield's proposal.

Mr. Jensen commented that from the standpoint of the Public Health Service he could foresee no difficulties with Mr. Brinsfield's proposal and thought it would help avoid some of the very unpleasant situations that have been encountered.

Mr. Fisher inquired if the proposal also included breaded oysters. Mr. Brinsfield replied "yes", but pointed out that it would be the meat of the breaded oysters and not the breaded oyster per se. Mr. Fisher then indicated they had an oyster breading operation in Indiana and inquired whether it would be under the Certification Program. Mr. Brinsfield replied "no", it would only apply to the shellfish themselves, i.e. the oysters, would have to be from a certified source. Mr. Fisher indicated Indiana already had that and it appeared that Indiana and Maryland were ahead of some of the other States.

Mr. Jensen indicated they were also ahead of the Public Health Service and inquired if there were any others who wished to comment. There being no response, he indicated Mr. Brinsfield's proposal would be considered as adopted by the Workshop and would be so recorded.

It being 5:20 p.m. the Chairman, Mr. Dana Wallace, announced that Mr. Felsings paper on imports would be held over until the following morning ant that the Workshop was adjourned, and would reconvene at 9:30 a.m. the next day.

Wednesday Morning - November 18, 1964

Mr. John Trygg, Chairman

The Workshop reconvened at 9:30 a.m. on November 18, 1964 with Mr. John Trygg, Director, Division of Public Health Engineering, Louisiana State Board of Health, as Chairman. The Chairman introduced Mr. William A. Felsing, San Francisco Regional Office, Public Health Service, to speak on the subject of Shellfish Imports.

Report on Shellfish Imports

Mr. Felsing noted the prevalent increased interest of foreign countries in exporting fishery products into the United States to bolster their national economies through international trade. It was pointed out however that imported fresh and frozen oysters and clams represented less than 0.1% of the total fishery imports of this country, but that recent expressions of interest of foreign countries desiring to market their bivalve shellfish in this country would tend to indicate that there will be more and more shellfish imported during the years immediately ahead. Even though present imports are a small fraction of the total fishery products entering the United States, their associated potential public health significance is far greater than the statistical amounts of imports would indicate. Concern over the sanitary quality of fresh and frozen shellfish imports is not a new problem but stems from the concept that "control of source" or prevention of harvesting from areas of unsatisfactory quality is the most important aspect of protection of the public. Mr. Felsing pointed out that while the objective examinations of the Food and Drug Administration are of value, they cannot provide complete evidence as to the sanitary conditions under which the shellfish were produced, and cannot be relied upon as a total substitute for the "control of source" sanitary controls required by the Cooperative Program. The Public Health Service, therefore, cannot recommend the sale of fresh or frozen foreign shellfish produced outside the provisions of the Cooperative Program although such shellfish may have been legally admitted into this country. State action is presently the only truly effective means of controlling importation of non-certified foreign shellfish.

The current agreements with the governments of Canada and Japan worked out through the Department of State were explained by Mr. Felsing whereby certain of their shellfish shippers are currently listed on the Public Health Service list of certified shippers. It was indicated that constituents of the Republic of South Korea, Franch, Venezuela, Australia, New Zealand, American Somoa, and Iceland have indicated an interest at one time or another in sending shellfish into the United States.

It was pointed out that enactment of Federal legislation for control of the public health aspects of non-certified shellfish imports would appear to offer the most promising solution to the problem. However, Bills introduced at the second and first sessions of the 86th and 87th Congress, respectively, were not passed although interest in the field continues. The Oyster Institute of North America, the Conference of State Sanitary Engineers, and the Association of State and Territorial Health Officers have all endorsed the principle of Federal legislation as providing a mechanism for controlling the sanitary quality of imported shellfish, however, the Department of Health Education and Welfare has not at this time taken a formal position on the matter. In the absence of specific legislation, the Public Health Service will continue to consider the extension of the sanitary provisions of the Cooperative Program to other countries wherever technically possible, and with due regard to the limitations of available fiscal and personnel resources. State and local health agencies must necessarily retain the responsibility of permitting or denying the sale of shellfish imported from those countries not extended Shellfish Sanitation agreements. Mr. Felsing also presented tables of imports on clams and oysters covering the calender year 1960 through 1964. (Mr. Felsing's complete paper is included as Appendix Q of these Proceedings.)

Mr. J. Richards Nelson commented that it would appear that one of the prices we pay for the fact that the Shellfish Sanitation Program is a voluntary program is that foreign shellfish can come in produced under conditions which we would not accept or certify in this country. He questioned whether or not the price of asking that our voluntary program be made a matter of law was worth the cost of doing it but indicated it would seem to him as a layman, not a lawyer, that if we were operating under a law saying that operators had to be certified by the U.S.P.H.S. for interstate for interstate shipment, that this would take care of the foreign import situation. He asked whether that was a logical conclusion or an over simplification of the problem.

Mr. Jensen explained that under the General Agreements on Tariffs and Trades, that would be the only way the problem could be resolved. Under agreements with other nations we cannot have higher standards or use our sanitation standards as a barrier to legitimate foreign trade. However, if we were operating the national program under a law in which our interstate shippers were required to meet certain standards, then these same standards could also be applied through law to shellfish which might come in from outside the United States. Apparently the only solution to a problem of this kind is in law. The other solution is the one we have used in the past, and this is a negotiated agreement with each country. Although it has worked with Canada and Japan, each country presents a whole new set of problems and we have no real guidance as to how we should proceed in a new situation. Recent discussions with State Department representatives on some of these problems had led him to believe the State Department would probably favor legislation which would clarify the rules under which shellfish might be imported and that the present situation is rather difficult to explain to representatives of foreign governments. Mr. Jensen said it was also a difficult problem for the States to handle as Mr. Brinsfield had pointed out earlier and it almost becomes a game for an importer to try to find a community or a State in which their product might be sold.

Mr. Trygg indicated he hesitated to ask the Workshop for endorsement of legislation to control foreign imports since such legislation, in his opinion, would perhaps end the cooperative program, but it might be in order to present the question to this Workshop since the previous Workshop had gone on record as favoring legislation.

Mr. Jensen then indicated the 1961 Workshop did not exactly endorse the principle of legislation but had requested the Federal government to investigate the problem of controlling imports, and they adopted a resolution in those terms.

Mr. Trygg pointed out that the Conference of State Sanitary Engineers, of which he is a member, has in its charges for this year to review their statement of policy of 1963 to determine the possible effects of Federal regulation on the present State Public Health Service Industry Cooperative Shellfish Sanitation Program.

Mr. Morgan asked whether such a law would terminate the voluntary relationship with the Public Health Service.

Mr. Trygg indicated this possibility exists and was the reason he hesitated to get into such a discussion, because he felt Workshop participants were not sure of it and that he felt it was a topic which needs more clarification before the Workshop could take action, but that he would go along with whatever the group wants to do. He further indicated it appears that if we have legislation for imports we must have legislation of a similar nature for our own industry.

Mr. Nelson asked whether, even if we had Federal legislation, the program could not continue to operate very much as it presently does.

Mr. Morgan pointed out that the industry believed it had an excellent relationship with the Public Health Service, other Federal agencies, and the State agencies in the past, and that he for one would not like to see this relationship terminated by a law that does not include a voluntary arrangement.

Mr. Trygg on noting the lack of further response from the Workshop participants on Federal legislation, indicated that it appeared that the group has not made up its mind and that in view of this the Workshop should proceed with the next topic on the Agenda.

Report on Control of Sport Harvesting and Intrastate Sale:

Mr. Eugene Jensen presented a paper on the Control of Sport Harvesting and Intrastate Sale. Mr. Jensen's paper is included as Appendix R of these Proceedings. Specifically Mr. Jensen presented the following four points pertaining to "intrastate" sale for endorsement by the Workshop:

1. Re-endorsement by the Workshop of the concept of a single sanitation standard for all shellfish:

2. That the Workshop request other interested groups, such as CSSE and ASTHO, to endorse the need for uniform standards:

3. That intrastate shippers not be considered in the PHS evaluation of State programs; and

4. A joint PHS - State progress report should be submitted at the next Workshop relative to the progress made in eliminating dual standards.

At the conclusion of the presentation of the above four points the Chairman, Mr. Trygg, indicated that action by the Workshop was needed. He therefore asked for comments on the above four points.

Mr. Jensen asked specifically that Mr. Girard comment.

Mr. Girard replied that the Washington group absolutely refused to talk on the issue. He explained that they refused to do so because any shellfish which will not be going into interstate commerce is not a responsibility of the Cooperative Program and therefore is not a concern of the Workshop. Accordingly, he could not comment or recommend it to the Workshop.

Mr. Bennett indicated the New York State Department of Conservation had a system of licensing whereby a different price is charged for interstate shippers than for intrastate. However, New York maintains the exact same standards for the interstate shipper as the intrastate shipper. New York is quite in favor of endorsing the above four points and sees no reason why we should have dual standards, and has no intention of entertaining such a program.

Mr. Nelson pointed out that as an industry member he could see no reason for not endorsing Mr. Jensen's recommendations as he thought they were entirely logical. He further said that after all, what we are talking about is a sanitary program that assures the consumer a good product, and he could not see that it makes any difference whether it crosses State lines or not, it should have the same basic qualities.

Mr. D'Alfonso of the Louisiana State Board of Health asked "What is the purpose of having intrastate shippers? An intrastate shipper might sell to an interstate shipper who in turn sells his oysters in interstate commerce. Is he considered a certified dealer in doing so, with a dual set of standards? Is it a small operator that just wants to sell locally, and if he gets a larger order, can he sell to an interstate shipper?"

Mr. Trygg indicated that the word "intrastate" concerns itself strictly within the State, and any time it gets involved with an out of State program it becomes the interstate program.

Mr. D. Alfonso pointed out that "intrastate" oysters could get into interstate commerce.

Mr. Jensen agreed there was always this possibility. However, if the State feels they can keep the two separate and there is no evidence in our review of the State program that there is any shipment between the two dealers then we would have to accept the two classes. It was explained that he agreed with Mr. Girard that the problem is not the business of the Cooperative Program as such but that essentially what the above points do is to ask the health agencies in the United States to evaluate what they are doing now to ascertain if really adequate protection is being provided their own consumers and to tourists who may visit the area.

Mr. Trygg requested a show of hands of those for and against the above four points delineated by Mr. Jensen. Mr. Trygg then indicated that the show of hands indicated the majority were in favor of the concepts as given by Mr. Jensen.

Mr. Jensen then indicated that we must recognize that there are a few States who will abstain from any participation in these concepts for various reasons and that this would be reflected in the Proceedings.

Mr. Jensen then continued with his prepared paper and specifically presented the following three points, pertaining to sports harvesting, for endorsement by the Workshop:

1. That there be an endorsement of the principle of a single sanitation standard for all shellfish sold or harvested in the United States;

2. That each State be recommended to examine how it controls the problem of sports harvesting and that each coastal State be urged to take necessary steps to prevent or discourage the harvesting of shellfish from contaminated or toxic areas; and

3. That the Public Health Service be requested to prepare a yearly report on the status of this problem and that the resulting report be made available to interested organizations, such as ASTHO, CSSE, ASMFC, etc., and the States.

Mr. Trygg indicated the above as delinated by Mr. Jensen was now open for comment and that although they were in essence very similar to the previous ones discussed it would be desirable to have a record of the group opinion.

Mr. Bennett raised a question as to whether use of the word "sold" in the first item implied interest in the boats or equipment used in sports harvesting or whether the application referred to the location of harvesting.

Mr. Jensen indicated the most important word here was "harvesting" and it was not intended to indicate interest in the methods and equipment used for sports harvesting.

Mr. Bennett indicated that in that event the State of New York was in accord with Mr. Jensen's proposal.

An unidentified voice among the Workshop participants suggested that the words "sold or" be removed from the first item as a person engaged in sports harvesting was obstensibly not harvesting for sale.

Mr. Jensen agreed to removal of the words "sold or" from the item.

The Chairman, Mr. Trygg, indicated that the record would show the removal of the two words "sold or."

Mr. Pringle raised the point that this would give any person the opportunity to pick oysters out of polluted water. Mr. Jensen said this is almost a God-given right in some States, and that the custom goes back to the days of colonial settlement. Mr. Pringle suggested that the item might be changed to read "prohibition of taking for any purposes" as it is part of the State Health Departments duty to prevent people from making themselves sick. Mr. Jensen indicated this was his view and he thought it was of no business of the Cooperative Program as such, but it is something we have an obligation to bring to the attention of the appropriate interest groups.

Mr. McIntyre commented in reply to Mr. Pringle's point that he worked in one State where the State prohibited harvesting for commercial purposes from polluted waters and the Fish and Wildlife Service of the same State advertised that particular place as excellent for sports harvesting of shellfish. Mr. Pringle replied that in the State of South Carolina, it is the State Board of Health that declares what lands are open or closed, that commercial fisheries lease land, and that the State Board of Health declares closed areas.

Mr. Trygg pointed out that he did not understand some of the discussion as it seemed to him the Workshop as a group should be interested in anything that is good for industry over-all and that he, as State Sanitary Engineer wanted standards covering harvesting to be just as rigid in his State, for his people, as it is for others harvesting shellfish to be shipped. He then called for a show of hands from those who were in favor of the last three principles delineated by Mr. Jensen, and subsequently, a show of hands of those not in favor. He then indicated that since there were no hands raised in opposition to the proposal that the record showed that some participants abstained from voting and apparently had no feeling in regard to the matter.

Report on "Bacteriological Criteria for Shellfish Growing Areas" by William J. Beck, Director, Northwest Shellfish Sanitation Laboratory, Purdy, Washington

Mr. Beck's paper was presented by Mr. C. B. Kelly. It summarized the data collected by the States and the Public Health Service regarding the use of the fecal coliform test in evaluating growing areas and presented a proposed fecal coliform standard for use as an alternate to the present growing area water standard. The proposed fecal coliform standard would be used as an alternate to sub item c, Section B, page 13 of Part I of the 1962 Revised Shellfish Sanitation Manual worded as follows:

Suggested Change, Page 13, Item 3 Approved Areas:

It is proposed that a new sub-item (d) be added after item c which would read as follows:

Agencies not desiring to use the above shellfish growing water standard may alternately use the following:

The fecal coliform median MPN of the water does not exceed 7.8 per 100 ml. and not more than 10 percent of the samples exceed a fecal coliform MPN of 33 per 100 ml, (or 46 per 100 ml where a 3-tube decimal dilution test is used) in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions. (Note: Under no circumstances should these standards be used to usurp sanitary surveys and other criteria for approved areas as outlined in Sanitation of Shellfish Growing Areas, Part I, Section C.) (Mr. Beck's complete paper is included as Appendix S of these Proceedings.)

Mr. Hope inquired of Mr. Kelly whether the 24 hour incubation period should be used in the test for fecal coliform organisms. Mr. Kelly explained that one of the recommendations made by Mr. Beck was that the 24 hour incubation be accepted. He further pointed out that the 24 hour incubation period is recommended for the fecal coliform test of fresh water by the Water Supply and Pollution Laboratory at the Sanitary Engineering Center in Cincinnati.

Mr. Goggins pointed out that Maine was one of the States from which no fecal coliform data was received. The Department of Sea and Shore Fisheries has taken over full responsibility of evaluating growing areas in Maine and have accumulated some data since the last Workshop. This data tentatively indicates Maine could not meet the 7.8 E.C. fecal coliform standards. However they would go along with this as a supplementary test and discuss the failure at the next Workshop.

Dr. Tennant indicated they had been running this test in Canada for some time. However, they have not yet had the chance to analyze the data accumulated in the last 10 years or so in the light of the new proposed standard. He felt that for certain areas, it will be somewhat too severe. He believed that in certain areas it would not relate to the former standard of 70. It was indicated that if one refers to table 2, it will be noted that the median of the incidence of fecal coliform types, is likely to range from 11 percent to almost 100 percent. The new standard seems to demand that if the area is to meet the old standard of 70 for the total group and the new standard of 7.8 fecal coliforms, the incidence would only be approximately 11 percent. We know that in some areas it is almost 100 percent and that in some of these areas they would be unable to meet the new standard.

Mr. Trygg commented that perhaps the Workshop ought to have a clarification of the terminology at this point. He pointed out that the test being talked about is the fecal coliform test and not the E. Coli test.

Mr. Jensen indicated that he was having difficulty with some of the statistics in the proposal. Under the existing coliform standard of median 70 and the 90 percentile of 230 there is a statistical relationship between the two, in that 230 is approximately at the 95% confidence limit of the 70. The same relationship does not seem to hold in the two figures which Mr. Beck has given. Mr. Jensen wondered whether the figure 33 was the upper 95% confidence limit of 7.8.

Mr. Kelly remarked that this was checked out since we were sensitive to the need for holding to this relationship. The figure 33 is closer to the 95 percentile upper limit of 7.8 than is 23, the next lower MPN in the table. He said it was preferable to err in the area of greater public health protection.

Mr. Trygg commented that he had spent some time prior to the morning session with Mr. Kelly in reviewing past surveys in view of the new standards and found themselves in somewhat of an untenable position and had prepared maps and reports of their growing areas. As an illustration he held up a map showing plotted points on a regular survey and plotted points in red in evaluating the fecal coliform proposed standards. He noted there were six areas which would not comply with the proposed standard. Mr. Trygg emphasized that Louisiana has a lot of coastal and swampy area away from population centers with no pollution other than that from wild life. It was indicated that he and Mr. Kelly had come up with the term "supplementary" and he inquired of Mr. Kelly if in presenting the new standard orally he meant acceptance as a supplementary method rather than an alternate method.

Mr. Kelly indicated that whether it should be considered as "supplementary" or "alternate" was part of the discussion.

Mr. Trygg then indicated the question before the group was whether to accept the proposed standards as supplementary to the present standards with the thought that perhaps at the next Workshop they could be made a true alternate standard.

Mr. Carpenter indicated he thought the Workshop should note the difference between an alternate and supplementary standard. Mr. Trygg indicated a more fundamental decision is whether it should be included in the Manual, and then whether it would be "alternate" or supplementary. An unidentified person speaking from among the participants suggested that if there was going to be a change in the Manual, that it be an "alternate" rather than "supplementary."

Mr. Bellis commented that he thought that all can recognize the value of looking into the fecal coliform test, but at this point in time do we really want to change the Manual or do we want to accept this on an interim basis as a supplementary test? It would seem to him more practical than going through the formality of changing the Manual.

Mr. Trygg suggested that those in the group who had not applied this standard to their growing areas should do so before accepting the standard. He further indicated that Louisiana had applied the new standards to their growing areas and he was not entirely satisfied with them.

Mr. Jensen suggested that the Workshop might be well advised to consider this meeting as endorsing Mr. Beck's proposal as a supplemental method which could be used, and that the Workshop not go through the formalities of making a change in the Manual at this time.

Mr. Gregory pointed out that we had had to change our interim standards for oysters several times so perhaps we should not be too hasty in adopting this proposal.

Mr. Trygg then asked for a show of hands regarding Mr. Jensen's proposal which would not change the Manual but which would use the suggested fecal coliform standard as a supplementary method for study purposes for the next year or several years. Mr. Trygg indicated the "ayes" have it as there was no response from the Workshop participants to the contrary.

Report on "Interim Bacteriological Criteria for Oysters"

Mr. C. B. Kelly, Chief, Research and Investigations Section, Shellfish Branch, Public Health Service, presented a prepared paper on the above subject which summarized the extensive tests on market oysters by the States and the Public Health Service and which included the following recommendations and proposal for adoption by the Workshop:

RECOMMENDATIONS

The following standards are recommended to be applied to all shucked oysters at the wholesale level as received in interstate shipment. Except for four changes, the standards are the same as the current interim criteria for shucked Eastern oysters. The first two changes are suggested to accomplish uniformity with the recommended criteria for shellfish growing areas. The third change would more accurately define the technique for bacteria counts and the fourth would convert the numerical expressions of density to currently accepted terms. The changes are:

1. Substitute "fecal coliforms" for "*E. coli*."

2. Revise the definition of the fecal coliform group. Change the incubation period from 48 to 24 hours and stipulate the conditions for use of 45.5°C. air incubation.

3. Substitute "plate count per gram" for "total bacteria per ml."

4. Substitute "MPN per 100 grams" for "MPN per 100 ml."

Accordingly, it is the recommendation of the Public Health Service that the Workshop adopt the following proposed standard for shucked oysters:

Bacteriological Standards for Shucked Oysters at the Wholesale Market Level

Satisfactory

Fecal coliform density[*] of not more than 230 MPN per 100 grams and 35°C. plate counts[**] of not more than 500,000 per gram will constitute a conditional sample and may be subject to rejection by the State shellfish regulatory authority. If these concentrations are found in two successive samples from the same shipper, the State regulatory authority at the source will be requested to supply information to the receiving State concerning the status of operation of this shipper. Future shipments to receiving markets by the shipper concerned will depend upon satisfactory operational reports by the shellfish regulatory authorities at the point of origin.

Mr. Kelly's complete paper is included as Appendix T of these Proceedings.

At the conclusion of Mr. Kelly's presentation, Mr. Trygg, the Chairman, indicated the discussion was now open for comments from the floor.

Mr. Fisher said that he had previously discussed this recommendation and proposal with Mr. Kelly and that it was the view in Indiana that the proposal constituted a relaxation of the bacteriological standards for oysters. He mentioned that in Indiana it had been found that the industry can meet the original MPN of 78 and a plate count of 100,000 because last year's sampling showed a much higher percentage of satisfactory samples than the year before. He believed that 78 MPN for the fecal Coliform and the 100,000 standard plate count is a true criteria of a satisfactory sample and that they would continue to take action on samples on a similar basis as they did in 1962. Mr. Kelly, in continuing the discussion, pointed out that 78 was not the only figure mentioned in the 1962 standard. Also, 230 was mentioned and was acceptable if it did not violate the frequency established.

Mr. Sarraf indicated he concurred with Mr. Fisher's remark to the extent that they had carried out an extensive sampling program in Pennsylvania for the past two years and found that the shippers shipping into their State were able to meet the 78 fecal coliform density. He then posed a question: "Assuming we set a 78 or 230, or 500 or any other figure, are we saying then that if we do meet these standards you will not get sick from eating these shellfish?" He indicated that as far as Pennsylvania is concerned, it was believed there, they would go along with Indiana in saying they would accept shellfish having the fecal coliform density of 78, and not 230.

---

[*] Fecal coliform organisms are those which, on transfer to F. C. Medium from gas positive presumptive broth tubes show production of gas after incubation in a water bath at 44.5°C. ± 0.2°C. for 24 hours. Where air incubation is at 45.5°C. ± 0.2°C. utilized, comparative tests must be made to determine comparable time of incubation.

[**] Plate count is the number of bacteria determined by the "Standard Plate Count" procedure for shellfish described in the third edition of the APHA Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish.

Mr. Goggins stated he could not comment on oyster count results but in Maine they had been evaluating clams, both those shipped intrastate and those shipped out of State, for approximately eight months, and they had found a very confusing situation. He indicated that total plate counts had not been found useful. They did find a dramatic increase in coliform with what they thought was a breakdown in refrigeration. Clams fresh from the growing water had low coliform levels. When they reach the plant or market level they had extremely high coliforms with low total plate counts. He inquired if this might happen with oysters: Mr. Kelly indicated that there was the possibility that there might be a decrease in coliforms in the later stages of storage because of growth of competing micro-organisms.

Mr. Bellis indicated that when you come to the practical application of a standard, it did not appear to him that what had been proposed was truly a standard. "Granted that it is more or less a guideline, he said, it still does not specify anything unsatisfactory." Mr. Bellis suggested that the standard should specify what is unsatisfactory.

Mr. Kelly indicated he agreed with Mr. Bellis to a point but that we should remember that the proposed standard assumes that the products have been handled under the requirements of the certification program and that unless this assumption is made then we can not consider any numerical value. He felt that this point also answers the question about whether or not the standards preclude anyone getting sick. Further, although the title says conditional, it does allow for rejection of the product within the text of the conditional section.

Mr. D'Alfonso indicated that those in the Gulf area had had some problems with the interim standards. He remarked that the interim standards introduced in 1958 had been used to condemn their oysters when received in eastern markets. As a result the 1963 Gulf Coast Shellfish Conference requested that the interest of the 1958 interim standards be explained and they had gone on record to state that they preferred the fecal coliform test of 230. They found in 1962 that only sixty percent of their oysters could comply under the 230 standards. However, in 1963 and 1964 after improvements in some of their conditions they could comply in 92.5 percent of the shipments. Mr. D'Alfonso further remarked that he and his co-workers in the Gulf States believe that the 230 standard is more applicable in the Gulf States than the 78.

Mr. Girard commented that the interim standards applied only to eastern oysters, but as proposed at this time they would include the Pacific oyster and the Olympia oyster. He then stated that the data accumulated on the West Coast for the Pacific oyster is rather meager. The first time an extensive survey was made was in 1961-62, and there is no data at all for the Olympia oyster. He recommended that the Workshop endorse the standard as proposed by Mr. Kelly.

Mr. Howell indicated that he was in favor of the standard as proposed since our technology and our controls have not progressed to the point where we can effectively state a number and say that at this level it will cause illness.

Mr. Bellis questioned whether the standard being proposed had any true public health significance. He also pointed out that the decision as to whether the proposed standard was to be used or not was the State's.

Mr. Redman inquired if there really was a significant difference between an MPN of 78 and one of 230. Mr. Kelly replied that if we apply the confidence limits of .33 and 3.3 to 78 and 230 there is some overlapping, but there still is some significant difference.

Mr. Bower indicated that, although West Coast oyster-producers had some reservations about the proposal, they would go along with it as long as the word "may" was used in the phrase, "may be subject to rejection by the State shellfish regulatory authority."

Captain Chandler indicated the military was quite interested in acceptance of some type of standard since it procured and estimated million pounds a year. He said that although 78 is optimum, the military would go along with 230 if the Public Health Service feels it would provide ample protection.

Mr. Woodfield recalled that at the last Workshop there had been considerable discussion of interim standards, and that the industry relied generally on technical people to provide a standard which industry can operate by and have their merchandise received on a satisfactory basis, rather than on a conditional or unconditional basis. He therefore favored acceptance of the proposal based on the confidence he had in the evaluation of the work accomplished during the three preceeding years.

Mr. Sarraf commented that during the year 1963-64, Pennsylvania was credited with having 195 cases of shellfish-associated hepatitis. He then indicated he would like to have some guarantees, that if we do set the standard at 78, or whatever, that we can be reasonably sure that the people consuming these products will not get sick. He inquired if any work had been done to correlate this number with disease transmission. Mr. Kelly replied that the proposed standard is applied to a product which is handled under the strict regulations of the Cooperative Program. Further that both the States and the Public Health Service have been working and collecting data for years and that the products have gone through commercial channels and people have not gotten sick. Additionally, we cannot operate with any standard that is at all dangerous because by the time the examination is completed the product is consumed. Mr. Kelly mentioned that although there have been cases of hepatitis, no one can say that they did not come from illegal sources since the cases of which we have good knowledge involved violations of program requirements.

Mr. McGinnes stated that the industry would like to see a standard established to which all States could subscribe so that there would be no difficulties in shipping to the various States. He indicated that he ships to six different States at the present time and hoped agreement on a standard could be reached at the Workshop. It was indicated he supported the proposal as written.

Mr. Bennett indicated that New York State had done some recent sampling in their area based on the new proposed standard (230 fecal coliform and 500,000 total plate count). Whenever they had samples exceeding the above, the shipping States had investigated and had reported back some discrepency or irregularity in that the plant was not following the Manual requirements. Therefore, based on their experience they were willing to go along with the proposal although New York would use a higher standard for their own production.

Mrs. Wallace commented that under seasonal and geographical variations which exist in the industry, the industry group believes the proposed standards to be acceptable, safe, and that the industry could live with them.

Mr. Trygg asked for a show of hands for the against the proposal, most votes appeared to be in favor of the proposal, but since the vote indicated no clear or decisive agreement, he called on Mr. Jensen to resolve the matter.

Mr. Jensen pointed out that the standards under discussion were not arrived at hurriedly and that the original work started 10-15 years ago as a result of some problems the Canadians had with very high counts in shellfish shipped into Canada from the United States. He stated every possible avenue had been investigated, that the two values, the 230 fecal coliform and the 500,000 plate count, were realistic in terms of what is currently being produced in the United States; and that there has been substantial improvements in the bacteriological quality of the products as a result of using the interim standards. He mentioned that Mr. Bennett had indicated New York used more stringent bacteriological standards for their own products, but that it should be remembered that their product can be marketed very soon after it is harvested and removed from the water. It is known from experience that New York standards could not be met on the Gulf Coast and that there is no use in establishing a set of standards that shellfish could not meet to begin with. It should be recognized that there has to be some element of compromise if the standard is to apply over a broad geographic area and that the standards are intended to apply only to shellfish that have been produced under the Cooperative Program in which shellfish are safe to eat when they are removed from the water. Further, standards serve the purpose, first, to reflect the refrigeration practices from the time they leave the shipper, and we feel these standards do this; secondly, they provide a clue to any gross errors that might have occured in the original classification of areas, and again we feel that these standards would be effective and safe. If it turns our that gross errors have been made, after 15 years study, we can come back in 2 years and make the necessary revisions. Insofar as the Public Health Service is concerned, Mr. Jensen said, it recommended the adoption of the standards, pointing out however that the individual States can establish much higher standards if they wish.

Mr. Trygg stated that it appeared that the Workshop had arrived at a point where the majority would like to adopt the proposed standards, but that there were a few who wanted to retain the 78 - 100,000 standard. He indicated that as to the legality of the standard, it would be up to each individual State to decide for themselves which standard they would enforce.

Inasmuch as the matter does not involve a change in the Shellfish Sanitation Manual it was therefore resolved by Mr. Trygg that the majority would use the proposed standard but there might be a very few who would use the previous interim suggested standard of 78 - 100,000. (Refer to page 190 of 1961 Proceedings Shellfish Sanitation Workshop)

At 12:40 p.m. Mr. Trygg recessed the meeting for lunch.

Wednesday Afternoon - November 18, 1964

Mr. Robert Brown, Chairman

The Workshop reconvened at 1:40 p.m. in the afternoon on November 18, 1964, with Mr. Robert Brown, Chief, Bureau of Environmental Hygiene, Maryland State Department of Health as Chairman. Mr. Brown called on Mr. Jensen for a word of summary concerning the morning session.

Mr. Jensen indicated that rather than leave the matter of bacteriological standards unresolved, he would prefer to have the record show that it appears to be the general concensus of the group that the standards as recommended in Mr. Kelly's paper would be acceptable. He would also want the record to show that at least two of the receiving States, Indiana and Pennsylvania have strong reservations regarding the use of these standards.

Mr. Brown asked the Workshop participants if there was any question concerning Mr. Jensen's summary statement. There being none, Mr. Brown introduced the next speaker, Dr. Arthur F. Novak, Professor and Chairman, Department of Food Science and Technology, Louisiana State University, who spoke extemporanously on the subject, "Initial Survey on Clostridium Botulinum Toxin, Type E".

Initial Survey on Clostridium Botulinum, Type E:

Dr. Novak indicated that, under a grant from the U.S. Atomic Energy Commission there have been collected approximately 800 to 1,000 samples of mud, oysters, and shrimp from the Gulf area. To date investigators had been unable to isolate but one Clostridium from mud in the intercoastal waterway and it was not Clostridium botulinum. Neither had they been able to isolate one Clostridium botulinum from Gulf oysters or shrimp, nor had they found any type E. Toxin. They were currently looking into the possibility of determining whether or not any virus are associated with Gulf shrimp and oysters. He further indicated they had searched most of the health records from the Gulf States and have not been able to find one case of botulism attributed to Gulf Coast shellfish. (Dr. Novaks complete extemperaneous remarks are included as Appendix U of these Proceedings.)

At the conclusion of Dr. Novak's remarks, Mr. Brown introduced Mr. Somers H. Pringle, Shellfish Section, Division of Sanitary Engineering, South Carolina State Board of Health, to speak on the subject of "Study of Hot Dip Process".

Heat - Shock Method of Preparation of Oysters for Shucking:

Mr. Pringle first reviewed the Field and Laboratory Studies on Heat - Shock Method of Preparation of Oysters for Shucking conducted by the Shellfish section of the South Carolina State Board of Health in cooperation with the PHS Gulf Coast Shellfish Sanitation Research Center. Thirty-two lots of shellfish meats and process waters collected and examined during various stages of the commercial process. The bacterial content of the immersion waters was found to be consistently low. Viable coliform organisms were recovered in only 2 of 31 samples tested. Viable fecal coliforms were recovered in only 1 of the 31 samples. The 35°C plate count ranged from 5 to 3000 organisms per milliliter. Tables on densities of coliform, fecal coliform, and plante counts, of oyster meats, during the cold shucking v.s. the heat shucking were presented. It was concluded from the studies that the heat-shock method shows a reduction in the bacteriological parameters which are used in assessing the bacterial qualtiy. (Mr. Pringle's complete paper on Field and Laboratory Studies on Heat-Shock Method of Preparation of Oysters for Shucking is included in these Proceedings in Appendix V.)

Mr. Pringle then reviewed the Economic and Conservation Aspects of the Shock Immersion Process in Commercial Handling of Shellfish in South Carolina. He related the costs, yields, and economic benefits, derived from 4 plants using heat-shock method and presented a table of Economic Phases of "Shock" Shucking as well as a questionaire form used in collecting the information. (Mr. Pringle's complete paper on the Economic and Conservation Aspects of the "Shock" Immersion Process in Commercial Handling of Shellfish in South Carolina is included in these Proceedings in Appendix V.)

In conclusion, Mr. Pringle presented to the Workshop a proposal that an Appendix D be inserted in Part II of the Shellfish Sanitation Manual which would specify the sanitary measures which should be required of those plants using the heat-shock method of preparation of oysters for shucking. As part of the proposal he presented a document for Workshop discussion and action entitled Appendix D, Heat Shock Method of Preparation of Oysters for Shucking, which contained 8 items of sanitation requirements, complete with Public Health explanation, and with Satisfactory Compliance sub-items. (The "Appendix D" Manual inclusion as proposed by Mr. Pringle is included in these Proceedings in Appendix V.)

Mr. Brinsfield inquired if the oysters used in the bacteriological examinations were washed in the laboratory, as it has been their experience that lower bacteriological results were obtained on shellstock when washed in the laboratory than when taken from their own liquor. Mr. Kelly indicated that all samples were examined in accordance with APHA recommended procedures.

Mr. Caldwell indicated he basically agreed with Mr. Pringle's proposal but that the wording relative to "found in one State" was questionable as they had a cluster-type oyster in North Carolina which were being used and that they would like to review the proposal before it was incorporated as Appendix D in the Manual. Mr. Pringle indicated the terminology was merely pointing out that there was some investigative work going on in one State as it was known that North Carolina was using the process, as well as possibly Florida. Mr. Caldwell agreed that the proposal was basically good but he thought the time and temperature relationships used in North Carolina were different from those contained in the proposal and he would like to have time to discuss this with the North Carolina industry people. Mr. Pringle suggested that perhaps the PHS might conduct research with North Carolina based on the time factors used in North Carolina. He indicated that when South Carolina first investigated the problem there was no control of the process at all. They had attempted making the process more sophisticated in refinement by doing experimental work, and had arrived at a 150 degree temperature. Mr. Pringle asked Mr. Caldwell if he put any of his plants using the process on the certified list of shellfish shippers. Mr. Salley indicated such plants were evaluated by the PHS in making the North Carolina program evaluations.

Mr. Keys asked Mr. Caldwell whether the oysters picked in the North Carolina process were construed as being fresh oysters or cooked oysters. Mr. Caldwell said they had discussed this with the North Carolina Department of Agriculture and they were waiting to see what the Workshop was going to do. Mr. Caldwell indicated there is very little change in the appearance of the oyster. A small difference in pH has been noted; the enzymes are altered with the heat process; and the oyster might have a milky cast. There is a certain section in North Carolina where these oysters are preferred to the cold-shucked oyster. It also has helped the economy of the area. They felt in North Carolina that if there was a temperature in excess of 143°F. it helped lower the pathogenic content of the product. As the detention time is increased and as the temperature is increased, there is produced a safer product.

Mr. Pringle said that he had no objection to the movement of North Carolina heat shocked oysters into South Carolina in interstate commerce, and was merely asking that South Carolina heat-shocked oysters be allowed to also move in interstate commerce based on the provisions of the proposed Appendix D.

Mr. Allen commented that it seemed to him Mr. Pringle has developed and followed through on a process that has been in use for several years, he has gone to considerable lengths to show that the product is as safe as conventionally shucked oysters; and if it is accepted by the Public Health Service then certainly the product should be acceptable to the Workshop.

Mr. McGinnis inquired if the oyster shucked was considered a fresh oyster. Mr. Pringle replied that the oyster was shucked as you would shuck any other oyster; and that in the work where investigations were made on the physical characteristics of the oyster, at the Shellfish Sanitation Research Center in Narragansett, was unable to detect any indications of physical change, this was contained in their report.

Mr. Jensen said that it was obvious that the Public Health Service was in complete agreement with Mr. Pringle's proposal, that the standards should be included as an Appendix to Part II of the Manual. Mr. Pringle then pointed out that his paper was really a product of the Public Health Service and they had allowed him the previlege of presenting it.

Mr. Harrison inquired whether anyone from the Public Health Service had approached the Food and Drug Administration as to proper labeling for the product. Mr. Pringle replied that the question had been posed to Dr. Slocum during the 1961 Workshop but that he had been unable to provide a definite answer at that time. Mr. Kelly then requested Dr. Russell to comment on this point.

Dr. Russell indicated that one of the problems they were concerned with was whether the oyster was raw or cooked and not whether it was a live oyster. It was indicated the Shellfish Research Center conducted some studies with heart beat, cilia movement, deactivation of enzymes, etc., under the conditions proposed--which was up to 150°F. for a period of three minutes, plus or minus 30 seconds,--and that the oyster did not appear to be like a cooked oyster and that they considered it to be a raw oyster. Dr. Russell further indicated the FDA would probably have a rather difficult time themselves making a decision. Up to the temperatures (150°F.) that were used, the oyster was considered as a raw oyster. Going to 160°F would be something else, but we are not asking for 160°, as we are only asking for 150° F. as the maximum.

The Chairman, Mr. Brown, asked for a show of hands of those in favor and those against the proposal. He then indicated it was his reading of the show of hands that a fairly substantual approval of those voting were in favor of the proposal by Mr. Pringle although he noted there were a number abstaining from voting.

Mr. Brown then introduced Mr. James Silva, PHS, to present the Proposed Changes in Part I of the Shellfish Sanitation Manual for consideration by the Workshop.

Proposed Changes in Part I of the Manual:

Mr. Silva directed the attention of the Workshop participants to a mimeographed sheet forwarded with the packet of informational materials sent to all participants in advance of the Workshop and which was entitled, "FOREWORD, A Declaration of Principles". (The complete Foreword is included in these Proceedings as Appendix W.)

Mr. Silva indicated that when Parts I and II of the Shellfish Sanitation Manual are revised after the Workshop, the Public Health Service is proposing that a Foreword, as worded in Appendix W, be inserted in Parts I and II. Mr. Silva then, in order to conserve time, read the three "principles" on Page 2 of the proposed Foreword which are as follows:

1. Shellfish are a renewable natural resource of significant economical value to many coastal communities, and should be treated as are other natural resources such as forest, water and agricultural lands.

2. Shellfish culture and harvesting represents a beneficial use of water in the estuaries. This use should be recognized by State and Federal agencies in planning and carrying out pollution prevention and abatement programs and in comprehensive planning for the use of these areas.

3. The goals of the National Shellfish Sanitation Program are: (1) the continued safe use of this natural resource and (2) active encouragement of water quality programs which will preserve all possible coastal areas for this beneficial use.

Mr. Brown then indicated that the question before the Workshop was approval of a Foreword for the Shellfish Sanitation Manual.

Mr. Bower indicated he was not too happy with certain wording of item one although he went along with the intent of the proposal. Specifically he objected to the words "Which should be treated as are other natural resources such as forest, water and agricultural lands," because he noted, since we have not taken care of our water, we do not want the shellfish industry treated as our water resources had been treated. He indicated also that as much weight should be given to this resource, as is given to our other natural resources.

Mr. Jensen suggested that item one be reworded as follows:

"Shellfish are a renewable, manageable resource of significant economic value to the community and should be managed as carefully as are other natural resources."

Mr. Bower agreed.

Mr. Gregory asked whether shellfish were not treated as a natureal resource by the States and should we think of natural resource management from the State level or think of it as a concept of national management

Mr. Jensen pointed out that even though they may be thought of as a natural resource in some States, this would not hold everywhere. He cited as an example, that Mr. Goggins had indicated there were over 46,000 acres closed in Maine which was like saying that 46,000 acres of forest land were allowed to burn. He pointed out that although they may be managed as a natural resource, he doubted they had been managed in the same way forest agencies, both State and Federal, manage forest resources.

Mr. Gregory indicated this was an acceptable idea.

Mrs. Wallace said that in her opening remarks at the beginning of thw Workshop the industry recommended this be adopted.

Mr. Brown then asked if there were any further objections which had not been resolved by the above named change in wording to be considered. There being no response he inquired if there was nay objection from anyone as to including the revised Foreword in the Manual. There veing no objection declared, he indicated it would be included in the next Manual revision.

Mr. Silva presented the next series of proposals as follows:*

PART I

SANITATION OF SHELLFISH GROWING AREAS

1. -- Suggested Change, Definition of the Word "Shellfish" in Parts I and II of the Manual: The definition of "shellfish" differs in Parts and II of the Manual, and they should be identical.

The definition in Part I is presently stated as follows:

> Shellfish.--All edible species of oysters, clams, or mussels. Shellfish products which contain any material other thant the meats and/or shell liquor of oysters, clams, or mussels will be regarded as a "processed food" and will not be included in the Cooperative Program.

The definition in Part II is presently worded as follows:

> Shellfish.--All edible species of oysters, clams, or mussels, either shucked or in the shell, fresh or frozen. (For the purpose of this Manual, the term does not include crabs, shrimp, or lobsters.)

---

* (The complete paper from which Mr. Silva's presentation was made is included in these Proceedings as Appendix X.)

Discussion: We propose to simplify the definition as the previous inclusion of references to processed food and to crabs, shrimp, or lobsters appears to unduly complicate the definition.

Shellfish.--All edible species of oysters, clams, or mussels, either shucked or in the shell, fresh or frozen.

Recommendation: That the Workshop endorse the above-proposed definition of shellfish.

Mr. Hollis inquired whether there was any intention or need to include mollusks such as snails and conch in this definition.

Mr. Silva indicated that historically the program had confined itself to clams, oysters, and mussels, because these animals are frequently eaten raw, and it was the intent of the Public Health Service to make the definitions in both parts of the Manual the same.

In the absence of further discussion the proposed change was accepted.

2. -- Suggested Change, Page 4, Section A. "Satisfactory Compliance, "Sub-item (a) of Item 1: That the first sentence of sub-item (a) be changed to read:

a. Classify all actual or potential shellfish growing areas as to their suitability for shellfish harvesting on the basis of sanitary quality as defined in Section C of this Manual, and to make compensatory changes in the related Public-Health Explanation and Satisfactory Compliance portions of the item as well as other items which contain similar wording and intent.

Discussion: It has been pointed out by several States that it should not be necessary to classify waters which for biological reasons will not support shellfish production. Accordingly, the above-suggested change requires classification of actual or potential shellfish-growing areas rather than all coastal waters.

Recommendation: That the Workshop endorse the above change.

The suggested change was adopted without discussion.

3. -- Suggested Change, Page 6, Section A, Item 2, Sub-item (e) of "Satisfactory Compliance": That the words "and inspection" be deleted from sub-item (e). This sub-item would then read as follows:

e. The following records are kept of shellfish sanitation activities as required in Sections, C, D, & E, Part I of this Manual, and when monthly summaries of State patrol activities are forwarded to the Public Health Service Regional Office.

Discussion: The monthly summaries of plant inspections forwarded by the States to the Public Health Service Regional Offices have not been useful

Recommendation: That the Workshop endorse the above revision.

The suggested change was adopted without discussion.

4. -- Suggested Change, Page 9, Section C, Item 1, Sub-item (a) of "Satisfactory Compliance": That the word "pesticides" be inserted after the word "wastes" in the second sentence of sub-item (a) which would then be changed to read as follows:

A comprehensive sanitary survey shall include evaluation of all sources of actual or potential pollution on the estuary and its tributaries, and the distance of such sources from the growing areas; effectiveness and reliability of sewage treatment works; the presence of industrial wastes, pesticides, or radionuclides which would cause a public-health hazard to the consumer of the shellfish; and the effect of wind, stream flow, and tidal currents in distributing polluting materials over the growing areas.

Discussion: The increased use of herbicides, insecticides, and other chemicals for predator control, constitutes a potential hazard to shellfish growing waters which regulatory authorities have to consider in conducting sanitary surveys of growing areas. It is necessary that the word "pesticides" be included in this sentence to provide Manual coverage of the practice.

Recommendation: That the word "pesticides" be inserted in the above section.

Mr. Boschetti indicated that he knew laboratory tests could determine DDT levels but inquired what levels should be established in determining whether growing areas should be closed or remain open.

Mr. Silva indicated that the intent was to require evaluation of the presence of pesticides in the same manner one would evaluate the presence of industrial wastes or radionuclides in growing areas.

Mr. Jensen indicated that the Public Health Service does not have a good answer for the levels or tolerances in growing areas because the Food and Drug Administration establishes acceptable tolerance levels in foods. Officially, the Public Health Service has brought the problem to the attention of the Food and Drug Administration. The problem will be resolved in one way or another in the near future. He pointed out that the proposed change was not inconsistent, but is saying that we recognize that the presence of pesticides in shellfish may be a public health hazard. Our research centers have been doing a great deal of pesticide analysis work and it is known that minute quantities of pesticides are found in some of the growing areas. Mr. Jensen agreed that this information may not provide a good answer, but he indicated that a solution to the problem would be worked out with FDA.

Mr. Brinsfield pointed out that in the case of milk, FDA was not interested in how much pesticide was in the feed or in the water, but how much there was in the milk. He thought FDA would not be interested primarily in how much pesticide was in the shellfish growing water, but how much was in the seafood.

Mr. Boschetti indicated that under the proposed change he still has to evaluate the significance of the presence of pesticides in growing waters and said the change provided no basis on which he could make an evaluation. He suggested deletion of this proposal for this reason.

Mr. Allen indicated that he agreed with Mr. Boschetti inasmuch as we had a "hot potato, that we did not know what to do with. We know about the critical situation in Louisiana where they have pesticides in growing areas." He said that unless someone could tell him how much was too much, especially since a great deal of it seemed to be run-off from agricultural areas, he felt the proposal should be dropped for awhile.

Mr. Jensen disagreed with Mr. Allen as to pesticides in shellfish. He pointed out that we have information on the levels of pesticides in their growing areas and in the shellfish, and that this information has been made available to the FDA. Without monitoring, there could only be speculation as to the actual pesticide level, and the possible hazard to public health. Mr. Jensen expressed the view that he was certain a realistic tolerance level both for waters and shellfish would be established.

Mr. Harrison indicated he agreed with those who opposed the insertion of the word as it did not seem to him to be practical since we had no standards or basis of fact to judge the areas.

Mr. Trygg pointed out that they all should be monitoring for pesticides because if they did not they might be placed in a very embarrassing situation.

Mr. Boschetti said he did not object to the subject being in the Manual but objected to it being in that portion which directed the States to evaluate. "If you are going to test for pesticides, he said, you have to evaluate." He confessed he did not know how to evaluate some of these substances.

Mr. Gruble spoke on behalf of the West Coast Industry and indicated they would like to see the proposal included as they had been faced with spraying of lands by various State agencies and have always come up with the fact that no adequate record of levels of pesticides in growing areas was available. He believed that someone ought to start monitoring these waters and have the record in hand before the industry finds itself out of business.

Mr. Jensen explained that in putting the proposal in the Manual, we are not putting it in as a set of quality standards but saying that data should be collected to establish facts upon which a decision can be made as to whether the growing area is acceptable. Ignoring the problem and hoping it will go away is totally unsatisfactory. He said that by putting a single word in the manual, attention is focussed on the problem, and a reason provided to the States for doing it.

Mr. Brown asked for a showing of hands for and against the proposal. He also announced that although there were a few opposing the proposal, since the predominant sentiment was favorable, the proposal was therefore deemed accepted.

IDENTIFICATION PROPOSAL

5. Suggested Change, Page 1, Section C, Item 1: That a new sub-item (d) be inserted after sub-item (c) which would be worded as follows:

   d. The State agency having primary responsibility for this element of the Cooperative Program develops a system for identification of growing areas.

   Discussion: Experience has indicated that it is highly desirable that records and tags should contain information as to the growing area source of shell stock. The first step in attaining this achievement is for each State to develop a growing area identification system.

   Recommendation: That the Workshop endorse the addition of the above sub-item to Section C, item 1, page 9.

   Mr. Hobbs inquired whether a number system or common name system for identification should be used for each growing area. "If it meant either, he said, it would be acceptable to Maryland."

   Mr. Silva indicated that a previous proposal submitted to the States had permitted only a numerical system, but that this had been changed in order to permit the States the necessary latitude in using either.

   In the absence of further discussion the proposal was accepted.

6. Suggested Change, Page 11, Section C, Last Sentence of Item 1: That the words "within one year" be inserted between the word "made" and the word "if" in the last sentence of item 1, page 11. Further, that the word "detrimental" be inserted between the words "significant" and "change."

   A resurvey should be made within one year if the reappraisal shows a significant detrimental change.

   Discussion: The present wording indicates a resurvey should be made if the reappraisal shows a significant change, but does not indicate any time element. It is our belief that a year's time should be established for a resurvey if one is indicated to be necessary by the reappraisal.

   Recommendation: That the Workshop endorse the above insertion of the words "within one year" and the word "detrimental" in the last sentence of item 1.

   The proposal was adopted without further comment.

7. Suggested Change, Page 11, Section C, Item 2: That a footnote be added to item 2 indicating that some States may wish to use other terms in describing classification of areas. Accordingly the following wording for the footnote is proposed:

*States may use other terms or terminology in describing area classification; provided, that the classification terms used are consistent with the intent and meaning of the words "approved," "conditionally approved," "restricted," or "prohibited."

Discussion: One State has indicated they do not like the term "conditionally approved areas." We have no objection to any State using other terms in describing the classification in sub-item (a).

Recommendation: That the Workshop endorse the above footnote.

The proposal was adopted without further comment.

8. Suggested Change, Page 13, Section C, Item 3: That the word "pesticides" be inserted after the word "radionuclides" in the first paragraph of this item. Further, that the words "whenever the sanitary survey indicates the need" be substituted for the words "insofar as possible" in the next to last line of the paragraph. The first paragraph would then read:

   3. Approved Areas.-- Growing areas may be designated as approved when: (a) the sanitary survey indicates that pathogenic micro-organisms, radionuclides, pesticides, and/or harmful industrial wastes do not reach the area in dangerous concentration, and (b) this is verified by laboratory findings whenever the sanitary survey indicates the need. Shellfish may be taken from such areas for direct marketing.

Discussion: The increased use of herbicides, insecticides and other chemicals has discussed in the previously recommended change No. 4; consequently, this change is necessary as a follow-up on the previous recommendation. It is thought the words "whenever the sanitary survey indicates the need" is more definitive than the words "insofar as possible." Compensatory changes will be necessary in sub-item (b) of the satisfactory compliance portion.

Recommendation: That the Workshop endorse the above additions.

After discussion of the proposal at some length, which was very similar to the discussion of Item No. 4 above, the Workshop decided to withhold acceptance of this proposal until tolerance levels or standards were established.

Dr. Litsky requested that he be permitted to say a few words on the problem of pesticides. He stated that three years ago the cranberry growers of Massachusetts were "clubbed" severely because of pesticide residuals and that all those present knew what happened to a great industry. He pointed out that although the States had indicated they did not object to the Federal government doing the work, he pleaded with the States to realize that it was not the Federal government's responsibility to direct State laboratories. He pointed out that monitoring for pesticides is everyone's problem, including the shellfisheries industry, the States, and the Federal government. He urged that the States put pressure on their State universities to do research in this area, and on industry to put pressure on their States to monitor. He warned that if the States do not work with the Federal government in this, another cranberry fiasco may be a result.

9. Suggested Change, Page 13, Section C, Item 3: That the word "or" be inserted at the end of sub-item (c) and a new paragraph "d" be inserted after the present sub-item (c) in accordance with Mr. Beck's proposal.

   (Refer to Mr. William J. Beck's paper on Bacteriological Criteria for Shellfish Growing Waters for consideration of the proposal regarding an alternate bacteriological standard for growing waters.)

Mr. Silva explained that this item referred to the inclusion of an alternate growing area standard which had been discussed that morning, and it was decided that the use of this standard would be endorsed on a supplemental basis but would not be included as a change in the Manual. States would use it on a supplemental basis with their growing area evaluations but it would not be included as a standard in the Manual.

Mr. Pringle asked if he was correct in assuming it would not be used as an alternate. Mr. Silva replied in the affirmative.

There being no further comment, Mr. Brown indicated the above would be considered as reaffirming the previous action taken by the Workshop on this proposal. (Refer to the discussion under Mr. William J. Beck's paper on page 22.

10. Suggested Change, Page 18, the Heading, the First Sentence of Item 7, Sub-Item (a) of "Satisfactory Compliance" on Page 19: That the word "paralytic" be deleted from the item wherever it is presently used. The heading would be changed to read as follows:

   7. Closure of Areas Due to Shellfish Toxins

   The first sentence would be revised to read as follows:

   > The State shellfish control agency shall regularly collect and assay representative samples of shellfish from growing areas where shellfish toxins are likely to occur.

   Sub-item (a) of the Satisfactory Compliance portion on page 19 would be changed to read as follows:

   a. The State shellfish control agency collects and assays representative samples of shellfish for the presence of toxins from each suspected growing area during the harvesting season.

   Discussion: The occurrence of toxins in Gulf State waters which may not be related to the "Paralytic Shellfish Poison" of Northeast waters or Pacific Coast waters indicates the need for a change in wording of this item so as to include all and any forms of toxins which may appear in shellfish growing waters.

   Recommendation: That the proposed change be endorsed by the Workshop.

   The proposal was adopted without further comment.

11. Suggested Change, Page 20, Section D, Item 1, Sub-item (b) of "Satisfactory Compliance": That the word "direct" in this sub-item be replaced by the word "continuous." This sentence would then read as follows:

   > However, continuous supervision will not be necessary if relaying operations are carried out during a period when shellfish may not be marketed.

   Discussion: It is desirable that all relaying operations be under the immediate supervision of the State shellfish control or patrol agency. However, it has been pointed out that where closed marketing seasons exist for some species in one State, they would have difficulty complying with this item if "direct supervision" were indicated, but could comply if the words "continuous supervision" were used.

   Recommendation: That the Workshop endorse the above change.

   The proposal was adopted without further comment.

12. Suggested Change, Page 20, Section D, Sub-item (c) of item 1: That the wording of sub-item (c) be changed to read as follows:

   c. State permission to relay shellfish is given only to responsible persons; responsibility to be determined by the past record of the permit applicant.

   The present wording of this sub-item is presented below:

   c. State permission to relay shellfish is given only to responsible persons, unless the entire operation is under direct supervision of the State. Responsibility shall, when possible, be determined by the past record of the permit applicant. It is recommended that applicants be required to post performance bonds.

Discussion: Deletion of the words "unless the entire operation is under direct supervision by the State" would require that all relaying operations to be under the direct supervision of the State, as it is believed this requirement is necessary to prevent illicit sale of shellfish during relaying operations. It is also believed the recommendation for a performance bond is presently unwarranted.

Recommendation: That the Workshop endorse the above change.

Mr. Boschetti inquired if the use of the word "recommended" required applicants to post performance bonds. Mr. Silva said he thought Mr. Boschetti was referring to the present wording of the item in the Manual but that the proposal would delete this recommendation. Mr. Bower said his only objection to it was that it looked like one had to have some record in order to do anything and that if you don't have a past record, you can't do anything. Mr. Girard commented that neither he nor anyone in the Washington State Health Department really have the right to evaluate "responsibility," as only the courts of Washington determine this. Mr. Pringle commented that in South Carolina the relaying privileges are granted by the State Board of Health, and they had a law that you can't relay except in the closed season.

In the absence of further discussion the proposed change was accepted.

Mr. Brown then introduced Mr. Leroy Houser, Public Health Service, to present the proposed changes in Part II of the Manual.

Mr. Houser presented the next series of proposals as follows:*

PART II

SANITATION OF THE HARVESTING AND PROCESSING OF SHELLFISH

1. Suggested Change, Page 3, Definitions: That a definition of the word "person" should be included in the definitions of Part II. The following wording for a proposed definition is suggested:

   Person.--Person shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

   Discussion: Although we do not have strong convictions that a definition of the word "person" is required in the Manual, we have no objection to its inclusion.

   Recommendation: That the Workshop endorse the above definition of "person" for inclusion in the definitions of Part II.

   The proposal was accepted without further comment.

2. Suggested Change, Page 4, Section A, Sub-item (a) of "Satisfactory Compliance": That the word "ordinarily" be deleted from the wording of sub-item (a). This sub-item is presently worded as follows:

   a. Decks and/or storage bins are so constructed and located as to prevent bilge water or polluted overboard water from coming into contact with shellfish. Removable false bottoms will ordinarily be required in all small craft. including rowboats, skiffs, and power boats used in the transport of shell stock.

---

* (The complete paper from which Mr. Houser's presentation was made is included in these Proceedings as Appendix X.)

Discussion: It is believed the inclusion of the word "ordinarily" in the above paragraph is unnecessary as it adds nothing to the sentence and appears to indicate there may be situations where bilge water or polluted water may be in contact with shellfish.

Recommendation: That the Workshop endorse the above change.

Mr. Hobbs indicated some of the Maryland people questioned the deletion of the word "ordinarily" as they had interpreted the deletion to mean they would have to have false bottoms on the decks of buy boats. Mr. Houser replied it was not intended to apply to buy boats with high decks. Mr. Pringle objected to the deletion as it would also be confusing to South Carolina tongers. Mr. Houser then suggested that in view of the opposition to the proposal, that the Workshop go on record as rejecting it.

In the absence of further discussion the proposed change was considered as rejected.

3. Suggested Change, Page 4, Section A, Item 1, Sub-item (e): Sub-item (e) is presently worded as follows:

   e. Decks and storage bins of boats used for transporting shellfish from polluted areas to approved areas for relaying are cleaned and are given bactericidal treatment before they are used for the transport of shellfish from approved areas.

   It is proposed that the above wording be changed to read as follows:

   e. That portion of boats or trucks (decks, storage bins, floor beds, etc.) and all other equipment (shovels, wheelbarrows, rakes, etc.) in contact with shellstock during handling or transport from polluted areas to approved areas for relaying are thoroughly cleaned before they are used for the transport or handling of shellfish from approved areas.

   Discussion: The sub-item does not now include trucks and other equipment. In addition, it is questionable as to the effectiveness of bactericidal treatment on wooden surfaces such as boat decks.

   Recommendation: That the Workshop endorse the above change.

   The proposal was adopted without further comment.

4. Suggested Change, Page 5, Item 3: That a recommendation be inserted as the last sentence of item 3 to the effect that the State should maintain an educational program for harvesters concerning the dangers inherent in overboard discharge of body excreations. The insertion would be worded as follows:

   It is recommended that each State shellfish control agency maintain an educational program for harvesters concerning the public health significance and dangers inherent in the overboard discharge of body excreations.

   Discussion: The problem of waste disposal from boats has not been solved. It is believed more emphasis, particularly on education of harvesters, is warranted.

   Recommendation: That the Workshop endorse the inclusion of the above recommendation.

Dr. Haskin suggested that the last word be changed from "excretions" to "wastes", as excretions would only include urine and not fecal waste. Mr. Houser indicated this suggestion was entirely acceptable. Mr. Girard indicated the State of Washington, as has most of the West Coast States, had a number of educational programs for their citizens, including shellfishery personnel, and he doubted the wisdom of specifically indicting one segment of the industry by the above inclusion. Mr. Morgan pointed out that the wastes that go over board by shellfishery operations are so minute compared to docks and other kinds of shipping that he questioned whether the proposal would be effective. Mr. Howell suggested substitution of the words "all boat owners" for the word "harvesters". Mr. Houser indicated this suggestion was acceptable. Mr. D'Alfonso indicated he was curious as to what type of educational program can be given to harvesters when one does not know who they are. Mr. Houser replied that when the harvester receives his license the State would have some type of leaflet or educational material to give to him, or some means of warning him against the dangers inherent in the overboard discharge of body wastes in shellfish growing areas and that the State would decide on the adequacy of their educational program. Mr. Girard pointed out that we are trying to develop ground rules for sanitary operations of the shellfish industry and since the above is only a recommendation, he recommended that it be deleted as well as all other recommendations currently in the Manual.

After approving the changes in wording suggested by Dr. Haskin and Mr. Howell the Workshop endorsed the above proposal without further comment.

IDENTIFICATION PROPOSAL

5. Suggested Change, Page 5, Section A, Item 4: That a new item be inserted after item 3 which would be worded as follows:

    4. Licenses for Commercial Harvesters.--Each person who handles unshucked shellfish prior to delivery or sale to a dealer certified under the Cooperative Program shall have a valid State permit or license to do so.

       In the case of leased land, either the lessee shall be licensed or the person which harvests shall be licensed by the State. The State agency having primary responsibility for granting licenses shall maintain a record of all such licenses granted for review by the appropriate Public Health Service Rwgional Office.

    Satisfactory compliance.--This item will be satisfied when:

    a. Each person harvesting shellfish has a valid permit or license to do so.

    b. The State agency having responsibility for granting licenses maintains a record of all such licenses granted for review by the appropriate Public Health Service Regional Office.

    c. In the case of leased growing area(s), either the lessee or the person who harvests shall be licensed by the State.

    Discussion: This proposal is one of the identification proposals previously discussed with State agency personnel at regional and individual meetings. Licensing of harvesters provides a degree of control over their actions with respect to the Cooperative Program, which is not otherwise possible.

    Recommendation: That the Workshop endorse the above addition to the Manual.

Mr. Pringle indicated that the State Board of Health issued a health permit to all harvesters in South Carolina and that he could not commit the Division of Commercial Fisheries to a system of licensing. Mr. Jensen pointed out that the Conservation Agency in South Carolina had prior knowledge of the proposals and had not expressed any opposition, therefore he could see no way at present how we could consider their problem.

Mr. Houser pointed out that the word "permit" was in the first sentence of the item hence either a permit system by the State Board of Health or a licensing system by the Department of Conservation would be acceptable. Mr. Pringle indicated he thought the use of the word "permit" would in some measure solve his problem. An unidentified voice among the participants indicated that he did not believe we could legitimately license harvesters in Maryland unless it was done by the Health Department in a completely separate set-up. Mr. Harrison indicated he could see not reason for including this in the Manual as he did not know of any State which did not already license its harvesters. Mr. Keys indicated Florida had just instituted a program of issuing permits and he objected to all the work they had been through recently if the Workshop did not accept this requirement. Mr. Houser complimented Mr. Keys for his foresight in going ahead with the requirement before the Workshop had adopted it, and that Mr. Key's action indicated there must be a good reason for it.

Without further discussion the Workshop adopted the proposal.

6. Suggested Change, Page 12, Section B, Item 14: That a new item j be added after sub-item (i) which would read as follows:

    j. All blower tanks, skimmers, returnable shipping containers, shucking buckets and pans purchased and/or installed after September 30, 1965, shall comply with the sanitation requirements contained in the Shellfish Industry Equipment Construction Guides published by the Public Health Service. (Copies are available from State shellfish sanitation agencies or Public Health Service Regional Offices.)

    Discussion: The Shellfish Industry Equipment Construction Guides were adopted by the 1961 Shellfish Sanitation Workshop and were published in April 1962. Subsequently, their use has not produced the desired effect of up-grading the sanitation features of blowers, skimmers, etc., on new purchases. It is believed making their use mandatory on purchases after September 30, 1964 would gradually improve the sanitary features on such equipment in use. One State has suggested an effective date of September 30, 1966. We are agreeable to any effective date satisfactory to the Workshop.

    Recommendation: That the Workshop endorse the above addition.

    The proposal was accepted without further comment.

7. Suggested Change, Page 13, Section B, Item 16: That sub-item (e) be rewritten to include the word "bactericides" in the first sentence. The sub-item would then read as follows:

    e. Adequate cleanup facilities, including sinks, bactericides, detergents, and brushes are available within the plant.

    Discussion: When this portion of the Manual was written the word "bactericides" was omitted.

    Recommendation: That the Workshop endorse the above addition.

    The proposal was accepted without further comment.

8. Suggested Change, Page 17, Section B, Item 21: That the Public-Health Reason and the Satisfactory Compliance of Item 21 be changed to prohibit the return of overage (bluff) from the packing room to the shucker. The first sentence of the sixth paragraph of the Public-Health Reason would be changed as indicated in item 1 below and in item 2, a new sub-item (g) would be added to the Satisfactory Compliance portion which would be worded as stated in the following item 2, sub-item (g):

    1. The return of overage (bluff) from the packing room to the shucker would ordinarily result in at least a portion of the shellfish being held on the shucking bench for more than two hours, and would permit an undersirable growth of bacteria.

    2. g. The return of overage (bluff) from the packing room is not permitted.

    Discussion: The return of overage from the packing room is considered an unnecessary practice which permits significant increases in the bacteriological content of the shucked shellfish and should be prohibited.

    Recommendation: That the Workshop endorse the above change in item 21 of the Manual.

    The proposal was accepted without further discussion.

IDENTIFICATION PROPOSAL

9. Suggested Change, Page 18, Section B, Item 24: That the last sentence of the first paragraph of Item 24 which requires code dating of frozen shellfish be deleted and that a new paragraph be inserted after the first paragraph of Item 24 which would be worded as follows, and that compensatory changes be included in the Satisfactory Compliance portion; i.e., sub-item (f):

> Each State shall establish a uniform code-dating system which shall be utilized by all shucker packers and repackers in that State to indicate the date of packing or repacking of all fresh and frozen shucked shellfish. (A recommended code-dating system is included in Appendix B.)

Discussion: This proposed change has been discussed with the States and it is generally agreed that the code dating of shucked shellfish assists the regulatory agency in determining the age of the product and in tracing shellfish to their point of origin. Code dating is also needed to translate age of product into bacteriological results. However, there are divergent views among the States as to whether the code-dating system should be uniform statewide, and whether one gallon containers should be code dated.

Recommendation: That the Workshop endorse the above wording as presently constituted.

Mr. Gregory reminded Mr. Houser that at the meeting with Region III States, it had been agreed that the item would apply only to normal-size retail consumer packages but that as presently worded it included gallon size containers. Mr. Houser said that what Mr. Gregory said was true, but that when he took the Region III States proposal to the meeting with the States of Washington, California, and Oregon, the latter three States pointed out that if there is sufficient justification for code-dating, it should apply to all sizes of containers. Mr. Houser indicated he was in agreement with the West Coast States' position. Mr. Gregory indicated he thought the requirement was impractical for gallon cans. Mr. Carpenter indicated that the State people in Texas were very much concerned about the practicality of code-dating gallon cans. Mr. Morgan said the industry had several objections to this in that they had chain store requirements as to dates of expiration of their choosing. He agreed however, that some classification system for oysters was needed to pin down where they came from and when they were packed, but did not know if it could be done in a uniform manner at the present time.

Mr. Houser indicated that he visualized that each State would establish it's own uniform code-dating system and that the industry in dealing with the chain organizations would simply have to explain to them that their individual States required that they use a specific code for dating purposes. Mr. Houser also explained that the original proposal as first submitted to the States contained a requirement for a uniform code-dating system over the entire U.S.A., but that several of the States objected because they had State-wide systems which they preferred over the system we suggested be included in Appendix B. Mr. Harrison said his industry group had discussed this and came to the conclusion that a uniform system might not be applicable to all packers, but that they would like to see each packer have and use his own system which would be registered with his State authorities.

Mr. Houser then proposed that the word "uniform" be omitted from the proposal to permit the individual packer to use any code-dating system he desired. Mr. Houser pointed out this system was in use prior to the 1959 Manual and permitted the packer to use any system satisfactory to the State as long as the State had knowledge of the code. Mr. Houser indicated this change would be acceptable to the Public Health Service since he gathered there was considerable opposition to a uniform code-dating system statewide. Mr. D'Alfonso then spoke in favor of the latter proposal as he felt code-dating was most important in State authorities having knowledge of the date of packing. Mr. Felsing indicated he had been authorized to speak for the State of California, that they required code-dating, and that they urged the adoption of the requirement. Mr. Gregory inquired of Mr. D'Alfonso if he had seen the code date on gallon containers. Mr. D'Alfonso said "yes" a regular stamp with metallic ink and it was so stamped when the container was dry. Mr. Gregory said that years ago we ruled out the rubber stamp for identification and expressed curiousity to know how we go about putting a code date on a gallon can if the code is to be embossed or impressed.

Mr. Houser pointed out that when he had met with the State of Washington, Mr. Girard had thought it was acceptable because we did not specify how it was to be done. It could be embossed, rubber stamped, gum labeled, etc. Mr. Girard said if this were passed, the State of Washington would require that it be legible and that if the rest of the States could do it, Washington will do it. Mr. Pringle inquired if this passed, would it apply as to date of pack only or to repack only? Mr. Houser replied that it applied to date of pack and date of repack. Mr. Harrison objected to the need for code-dating of frozen oysters as he believed customers could detect the code date meaning and might reject a package of frozen shellfish which were entirely satisfactory because of the date. Mr. Houser pointed out that the code-dating requirements in the Manual for frozen shellfish did not require it to be on the outer wrap.

Without further discussion, the Workshop adopted the proposal, with the deletion of the word "uniform".

(Note: The following proposed change and subsequent discussion is based in part on the paper by Mr. C. B. Kelly entitled "Time-Temperature Effect on Bacteriological Quality of Stored Oysters". This paper was not presented at the Workshop but was distributed in advance to Workshop participants as the basis for a change in the refrigeration requirements for shucked oysters. (Mr. Kelly's paper is included in these Proceedings as Appendix Y.)

10. Suggested Change, Page 19, Section B, Item 25 "Refrigeration of Shucked Shellfish": That the Public-Health Reason for this include the following additional paragraphs:

> In addition, research by the Public Health Service with *Crassostrea virginica* and *Crassostrea gigas* stored in ice and at 37.5° F. sustained slight increases in coliform MPN's during the first five days of storage. After the storage period of five days, there was a continuous increase in MPN values until the 25th day, at which time the coliform MPN's exceeded the original values by at least 50 times. Oysters from the same lots stored at 50° F. sustained a continuous increase in coliform MPN's exceeding 1000 times the original count within five days.
>
> In the same studies oysters stored in ice and at 37.5° F. sustained only slight increases in standard plate counts after being stored for five days. However, with a storage temperature of 50° F. the same oysters sustained plate count increases which exceeded 100 times their original count within five days.
>
> The fecal coliform MPN's decreased slightly from their original MPN values during storage in ice, at 37.5° F. and at 50° F., with the exception that there was a frequent increase in fecal coliform MPN's at the 50° F. storage temperature. (See Time and Temperature Effects on Stored Oysters by C. B. Kelly, Proceedings 1964 Shellfish Sanitation Workshop, available from Shellfish Sanitation Branch, Public Health Service, Department of Health, Education, & Welfare, Washington, D. C. 20201.) Appendix B contains charts, figures 1,2, and 3, which present the above information in graphic form.
>
> It was concluded that to avoid adverse bacterial multiplication it is necessary to refrigerate shucked oysters immediately after shucking to 40° F. or lower.

Discussion: In previous proposals to the industry and the States it was recommended that this item be changed to require a refrigeration temperature of 40° F. or 45° F. Several States and some portions of the industry were opposed to this on the basis that it would create undue hardship.

Recommendation: That the Workshop endorse the above addition.

In introducing the above proposal Mr. Houser pointed out that it constituted a change only in the Public Health Explanation" and did not require cooling of shucked shellfish to 40° or 45° F. but merely pointed out the desirability of cooling to these temperatures. Mr. Jensen indicated he thought it was a poor way to handle the cooling problem inasmuch as it was reported earlier to the Workshop that shellfish spoils rapidly at temperatures above 40° F. He suggested that the consumer has the right to expect that he will get a product that will not make him sick but will also be fit to eat. Mr. Kelly noted that it had been demonstrated that when we get multiplication of E. coli we get multiplication of salmonella. Also that the Workshop would be well advised to require lower refrigeration standards for shucked shellfish. Mr. Girard indicated there was no doubt that we get better quality shellfish with lower cooling temperatures. However, there was no public health reason for a different temperature than the 50° F. currently required. He further indicated that the State Board of Health in Washington is supreme in developing laws or regulations relating to the sanitary aspects of shellfish but such laws and regulations had to relate to the transmission of disease.

Mr. Brown asked for a show of hands for and against the proposal, however, an unidentified person wanted to know if the vote was for a lower temperature. Mr. Brown replied that the vote was on the change as proposed, which only pointed out the desirability of cooling to 40° F. and was not a requirement. Another unidentified voice inquired whether the Workshop was being asked to accept a temperature of 45° F. within two hours after packaging? Mr. Houser explained the proposal was only to include in the Manual under the "Public Health Explanation" some of the research material which indicated the need for cooling of shucked shellfish to 40° F. or below. Mr. Hobbs pointed out that the Region III States had had a long discussion with the Public Health Service representatives at the Old Point Comfort meeting and it was agreed there that the requirement would require cooling to 45° F. or below. He inquired whether this was in the proposal or whether we were talking about cooling to 40° within two hours after shucking. Mr. Houser said "neither": that we were only pointing out the need for lower cooling temperatures in the "public health explanation". Mr. Hobbs then said that if lower temperatures were needed, why was'nt the Public Health Service asking for them? Mr. Houser stated that the majority of the States and some of the industry had opposed the requirement of lower temperatures during their regional meetings, consequently we had ended up with a public health recommendation. Mr. Brown pointed out that if the Workshop favored a more stringent cooling standard, there would be nothing to preclude such a change being considered in lieu of the present proposal. Mr. McIntyre indicated that considerable information had already been provided that 50° was not a satisfactory cooling temperature; that other portions of the food industry had dropped their cooling temperatures to 45° F.; that the present proposal was superfluous in that it does not require any change in cooling temperatures; and that for the Manual to be worthwhile the proposal should be changed from a recommendation to a requirement. Mr. McIntyre then made a motion that the temperature cooling requirement in the Manual be changed from 50° F. to 45° F. This motion was seconded by Mr. Hansell.

Dr. Mosley commented that more sophisticated epidemiological techniques are being used and are particularly helpful in salmonella surveillance. He pointed to the problem of cracked eggs in the poultry industry which had been recently discovered by epidemiological techniques and indicated he thought it would be much to the shellfish industry's interest to adopt a safe cooling temperature as a requirement.

Mr. Brown indicated it was the purpose of the motion to change the cooling requirement in the Manual from 50° F. to 45° F. and that until the issue was disposed of, discussion should be confined to this motion.

Mr. Willerford incicated that Connecticut at this time was considering lowering their temperature requirements and would probably go ahead and do so.

Mr. Bower commented that the West Coast industry did not oppose the temperature decrease but objected to the time allowed to reach the lower temperature. He indicated that without precooling the product, which is practically impossible for all shucker-packers, it is impossible to refrigerate the center of a large container to 40° F. within two hours after packing. He proposed an amendment to the proposal which would permit the shellfish to be cooled to 45° F. "as soon as practical after packing."

Dr. Mosley pointed out that the classic way to cause food poisoning is to refrigerate egg salad in too large a container. "The center portion may be warm, he said, and remain warm for a long time." "If staphylococci are present, a number of people may get food poisoning. He suggested that it is the responsibility of industry to package foods so that they are quickly cooled to a proper temperature."

After some further discussion the Workshop agreed to adopt the requirement for "cooling of shucked shellfish to 45° F. as soon as practical after packing." (Note: This decision was reviewed by the Workshop at the Thursday morning session and changed to read as follows:

"Shucked shellfish shall be cooled to an internal temperature of 45° F. within 5 hours after shucking. Storage temperatures shall not exceed 45° F. Storage at 34-40° F. is strongly recommended to preserve quality."

Mr. Brown then brought up the original proposal to change the Public Health explanation of item 25 to read as indicated in No. 10 above. Without further discussion, it was adopted by the Workshop.

The Workshop was then recessed at 5:15 p.m. to reconvene at 9:30 a.m. the following day.

Thursday Morning - November 19, 1964

Mr. Ralph Van Derwerker, Chairman

The Workshop reconvened at 9:30 a.m. on November 19, 1965, with Mr. Ralph Van Derwerker, Regional Program Director, DEEFP, PHS, New York Regional Office, as Chairman in lieu of Mr. John Faulkner who was unable to be present. Mr. Van Derwerker called on Mr. Eugene Jensen to review the actions taken by the Workshop during the latter phases of the previous afternoon's discussion.

Mr. Jensen noted that the Workshop had several items of unfinished business which should be handled at this time. The first one was the position the Workshop might take on the problem of depuration. He reminded the Workshop that on Tuesday, in his presentation on Depuration, he had suggested four points for the Workshop to consider; that Mr. Loring had presented in his paper on depuration seven points as a substitute for Mr Jensens four points; and that he and Mr. Loring had reworked together the several points into eight and had them circulated the previous day. The eight points were as follows:

It is the consensus of the Fifth National Shellfish Sanitation Workshop:

1) That the Cooperative-State-PHS-Industry Program for the Certification of Interstate Shellfish Shippers can be effective in assuring the production of shellfish of acceptable quality, but with the recognition that technical and administrative changes may be needed.

2) That much additional emphasis needs to be placed on pollution control and abatement in terms of protecting shellfish growing areas.

3) That relaying should be used wherever practical to reduce shellfish populations in contaminated areas.

4) That the potential value of depuration is recognized and that research and pilot plants be continued to gain additional information on the process.

5) That control over harvesting and transport to certified dealers be improved in any way possible. (In many areas this could be accomplished through use of designated "landing areas.")

6) That present schedules of fines and penalties for removal of shellfish from polluted areas be reviewed by the individual State and PHS. The objective of such review should be to better inform the courts on the public consequences of illegal sale of polluted shellfish and should seek fines and penalties commensurate with the probable public damage.

7) That the State recognize the need for strong marine police supervision of polluted areas, harvesting practices, and relaying, and that adequate financial resources be made available for these activities.

8) That Federal support for State shellfish sanitation programs be further investigated as recommended by the Association of State and Territorial Health Officers.

> "That the Public Health Service be requested to study the feasibility of securing Federal funds to assist States in shellfish control. Explorations should include the possibilities of weighted formula grants, project grants, contractual systems between Federal and State governments and also the possibility of building a weighting item for this purpose into present stream pollution funds."

Mr. Jensen asked if anyone had negative comments on the above proposals.

Mrs. Wallace said the revisions seemed to be quite in keeping with the spirit and the ideas presented on behalf of the Oyster Institute, and suggested that the industry support them.

Mr. Jensen then inquired if they would have any effect one way or the other on the Canadian-U.S. Program and asked Mr. Edmonds to state his views.

Mr. Edmonds said he believed the eight points would be acceptable insofar as Canada was concerned.

Mr. Jensen asked Dr. Mosley of the Communical Disease Center to express his views.

Dr. Mosley indicated he thought the position as stated in the eight points was reasonable, and that all present should be interested in depuration and its potential. He indicated CDC had been most concerned with the problems of hepatitis in relation to raw shellfish. He further indicated that there is sufficient evidence at hand, that some shellfish distributed through commercial channels is associated with a slightly increased risk of hepatitis. This risk is in addition to the epidemics which are known to have occured. "Depuration may be an answer to this problem" he said.

Mr. Sarraf indicated that Pennsylvania concurred in regard to the eight points.

After further discussion the Workshop adopted the eight point resolution.

Mr. Jensen then brought up the subject of refrigeration of shucked shellfish, indicating that there was some confusion as to what had been decided on the subject the previous afternoon. He said that an immediate cooling temperature of 40° F. had been discussed with the States and the industry and that there were general reservations and the feeling that the temperature set was too stringent and could not be met. He indicated that if the bacteriological standards previously agreed to were to be met, the storage temperatures should be held somewhere close to 32 or 33° F. Some of the States had suggested a cooling temperature of 45° F. as being more attainable.

Mr. Brinsfield pointed out that most food control programs require the cooling of products to 45° F. and that the National Shellfish Sanitation Program would be remiss in its duties if it did not seek to achieve a requirement of at least 45° F., even though it was known that 40° F. was more ideal. He indicated that the industry had not favored cooling to 45° F. and it seemed to him that they should favor a temperature which would provide the best quality product, one which would help lengthen shelflife.

Mrs. Wallace commented that the industry was very much interested in quality control and did not oppose the 45° F. cooling temperature requirement, but did oppose the establishment of an unrealistic time limit for the 45° F. temperature to be reached.

At Mr. Jensen's request, Dr. Mosley commented that although he had no personal experience with salmonella, he wanted to point out that where the opportunity exists for salmonella to multiply, there is very definitely a potential hazard. He indicated that through the salmonella surveillance program of CDC in cooperation with State laboratories throughout the country, certain food products had been definitely established as hazardous. So far, shellfish have not been involved. It would be much better to adopt a cooling temperature at which salmonella could not multiply before shellfish are found to be involved, he said.

Mr. Kelly pointed out that according to his charts a temperature of 45° F. would not do the job desired, and that it was merely a compromise figure between 40° F. and 50° F.

Dr. Litsky mentioned, in connection with Salmonella, that there is a new technique which enables bacteriologists to isolate one salmonella in a gram of material. Previously laboratory workers had been lucky to isolate one salmonella in 100 grams of material. This means, he said, that the sensitivity of the test is increased. This may reduce the bacteriologic standards by a factor of 10 to 1000. He urged the Workshop to adopt 45° F. now and think about 32° F. in the future because the bacteriologists are going to find certain bacteria with greater ease and accuracy in the future.

Mr. Brinsfield pointed out that the Region III group of States agreed and recommended that with the use of ice or refrigerated water, shellfish could be cooled to 45° F. within two hours, and that the storage temperature should be no higher than 40° F.

Mr. Gregory indicated they had two meetings in Virginia, one with their packers and one with the Public Health Service. Virginia repackers had pointed out that they had to maintain the oysters currently during repacking at 50° F. or below and if this temperature were changed to 40° F. it would be impossible for them to comply. They therefore had agreed to a 45° F. temperature although this would be difficult to comply with. At the meeting with the Public Health Service, taking into consideration the views of packers, it had been agreed that all shellfish should be cooled to 45° F. within two hours after packing and stored at 40° F. or lower. Mr. Gregory made a motion of his statement and this was seconded by Mr. Brinsfield.

Mr. McGinnes speaking for the Virginia industry group remarked that they preferred a 40° F. temperature requirement but even getting it down to 45° F. within two hours was the problem. If ice were used there was the danger of increase in bacteria count because ice plants roll the ice on the floor and it can thereby become contaminated. The Southern States where the temperatures are warmer would have an even greater problem. He mentioned that there was one packer who has refrigerated water running over the skimmer and who gets the oyster down to temperature of 45° F. as they go into the 5 gallon can, but that there were 5 other packers not having that kind of equipment.

Mr. Van Derwerker commented that the Workshop seemed to have an impossible situation in that the words "soon as practical" could be inferred to mean a week. He further pointed out that the discussion concerned reducing the temperature of the shellfish to 45° F. within two hours of packing and asked that consideration be given to the thought of amending the two hours to something which can be accomplished.

Mr. Blair indicated that they in Oregon, had in preparation for this discussion on cooling, had made some limited investigations. They found, that in using oysters in a gallon tin, they could not bring them down from 61° F. in a dry refrigerator set at 32° F. to 45° F. in two hours, but could achieve 45° F. in 3 minutes over four hours. Using flake ice at another plant and refrigeration set at 32 degrees, it still took over two hours to bring the temperature down. He suggested that the Workshop consider a period of 4 hours as being the minimum which could be considered in establishing a time standard.

Mr. Van Derwerker indicated that since Mr. Blair had proposed the above as an amendment to the motion that the discussion should be confined to "cooled to 45° F. within four hours."

Mr. Harrison spoke in opposition to the above amendment to the motion as creating an undue hardship in the industry. Mr. Hobbs indicated that better than 90 percent of the Maryland packers are now chilling their oysters to 50° F. or below within two hours and could reach the 45° F. within that time.

Mr. Kelly quoted from research previously accomplished. One gallon cans of oysters at a temperature 78° F. were packed in crushed ice and reached a temperature of 45° F. after 345 minutes (5 3/4 hrs.). One gallon cans of oysters packed in crushed ice at a starting temperature of 63° F. reached a temperature of 45° F. in 250 minutes (4¼ hours). One-half gallon cans of oysters packed in crushed ice at a starting temperature of 85° F. reached 45° F. in 200 minutes (3 1/3 hours). Starting at 66° F. half gallons of oysters in crushed ice required 144 minutes (2½ hours). If stored under dry refrigeration at 31-32° F., oysters in gallon cans at a starting temperature of 86° F. required 360 minutes (6 hours) to reach 45° F. Gallon cans stored at 31-32° under dry refrigeration but at a starting temperature of 67° F. required 390 minutes (6½ hrs.) to reach 45° F. One pint containers under dry refrigeration at 31-32° F. took 120 minutes (2 hours) to reach 45° F. from a starting point of 66° F.

Mr. Kelly then told of research accomplished when the Public Health Service laboratory was located at Pensacola where they had attempted to determine the temperature attained in the center of various sized containers. They had started out at 78° F. and wanted to find how long it would take to cool oysters to the Manual requirement of 50° F. A one gallon can when packed in ice required 4½ hours. A one gallon can when stored in the refrigerator (with blower) at 32-45° F. took 6½ hours. A pint jar took 1½ hours when packed in ice and 3 hours when in the air circulated refrigerator.

Based on the above, Mr. Kelly submitted to the Workshop that it is possible to attain the 45° temperature within a reasonable period of time and with a reasonable method of refrigeration.

Mr. Van Derwerker inquired if he thought Mr. Blair's amendment to the motion (cooled to 45° F. in four hours) could be attained. Mr. Kelly indicated it could not be, but if the time were extended an hour or two it could be, and that it would not endanger public health.

After some further general discussion of the problem, Mr. David Wallace proposed that the time be changed to five hours. There was then some discussion of what constituted a resonable time with Mr. Carpenter and Mr. Felsing stating that the words "reasonable time" should not be placed in the Manual but that the time allowed to reach a specific temperature should be specified. Mr. Van Derwerker then restated the proposal which was as follows:

> "Shucked shellfish shall be cooled to an internal temperature of 45° F. within five hours after packing. Storage temperatures shall not exceed 45° F. Storage at 34-40° F. is strongly recommended to preserve quality."

Mr. Brinsfield suggested that the words "after packing" be changed to "after shucking" since shucked oysters could be retained without cooling until they were packed, and this would be a very bad practice.

The Workshop without further discussion adopted the above proposal with the substitution of the words "after shucking" for the words "after packing."

Mr. Van Derwerker then called on Mr. Houser to proceed with the proposed changes in Part II of the Manual.

11. Suggested Change, Page 20, Section B, item 27 "Records": That the Satisfactory Compliance portion of this item be changed to read as follows:

> Satisfactory compliance.--This item will be satisfied when each shucker-packer, repacker, shellstock shipper, or reshipper establishes and maintains a ledger record or record system satisfactory to the State control agency indicating from whom shellfish were purchased or secured; the date purchased or secured; State designated areas from which the shellfish were harvested; and the names and addresses of persons to whom shellfish were sold. Failure to establish and maintain adequate records shall result in refusal of State agencies to certify shucker-packers for interstate certification. (An example ledger form is contained in Appendix B.)

Discussion: The only new requirement contained in the above which versus the present wording of the item is the establishment of a ledger record or record system separate from the financial records of the plant; the refusal of State agencies to certify plants for interstate sale; and that an example ledger form is contained in Appendix B. In practice, reviewing financial records has proven to be a monumental task for investigators and has led to much uncertainty as to the areas and sources from which shellfish were obtained.

It is believed that establishment of specific records concerning sources, area designations, dates, and sales would permit much quicker and more accurate tracing of suspect shellfish to their source. This change has been previously discussed with the States, and we are not aware of substantial objections at this time.

Recommendation: That the Workshop endorse the above proposed change in the Satisfactory Compliance portion of item 27.

Mr. Bassett commented that in circumstances under which the Maryland oyster industry operates, it would b a practical impossibility to keep a record on tongers from whom oysters were purchased. Buy boats worked on State property and bought from 50 to 100 different tongers each day. He suggested changing the requirement to "the area from which they were purchased, rather than the person.

Mr. Houser explained that the reason for the requirement was that during the several outbreaks of hepatitis control authorities had experienced much difficulty in finding out where the shellfish were purchased and from whom, and it was most important that records of these facts be available.

Mr. Pringle indicated that in South Carolina an oyster shucking plant receives oysters from their own leasees. Their pickers work for them and may go into several leased areas of various names and descriptions. All the picker is able to say is that he got the oysters from lease S.E.47. Mr. Pringle was therefore in favor of ommitting the name of the picker and requiring information as to the area from which the oysters were harvested.

Mr. Blair suggested the deletion of the words beginning with "and" following the word "failure" since he considered that these words were rather of a threatening nature.

Dr. Mosley pointed out that during outbreaks of hepatitis since 1961, it had been possible to trace commercially sold shellfish to individual shippers due to the record system in effect. This has been a very great contribution to the industry. If shellfish from a particular area are identified, then it is not necessary to issue any general warning about the hazard of eating shellfish. He further pointed out, however, that record keeping as it now exists is chaotic, non-uniform, and could be definitely improved.As Mr. Felsing and Mr. Wong could testify, as they had spent a number of days putting together data from shipper records during the Connecticut epidemic. He indicated their work could have been greatly faciliated by a uniform system. Dr. Mosley stressed that the record system needed to go beyond the shippers, as a shipper can be the unwitting victim of one or two unscrupulous harvestors, who do not care where they get their shellfish. The shipper may have the best intentions in the world, but he has no protection other than the possibility of identifying harvesters. He thought we had a very practical use for the name of the harvester selling to a shipper and pointed out that the recent epidemic in New Jersy was terminated when it was stressed that shippers whould know their harvesters and to buy only from those whose reputation and integrity they could trust. He felt that this is a matter of great importance. Although the existing record system has been of some protection to the industry, they could achieve more protection if individual harvesters can be identified.

Mr. Sieling indicated that Maryland has such a system and although it might not be operating at the one-hundred percent level at the present time, was being improved as they went along. They currently required the boat number or the name of the person shellfish were purchased from.

Mr. Pringle indicated that he was confused as to how the harvester can be identified after the oysters have crossed the skimmer or how any group of oysters can be identified with any specific harvester. Mr. Houser assured Mr. Pringle that the proposal did not include his point but only required shellstock shippers, shucker-packers, repackers, and reshippers to keep a record of the persons from whom shellfish were received, the date of receipt, the areas the shellfish were harvested from, and a similar record of sales.

Mr. Van Derwerker pointed out that the change requested had to do only with clarifying the present Manual requirement which says, "complete and accurate records shall be kept by every shellfish dealer."

Mr. Bassett clarified his earlier statement on the basis that he misconstrued the wording and thought it required the shellstock dealer to have to record the name of the original harvester even though the "buy" boat or truck would have this information. He suggested that "buy boats" and "buy trucks" should be included in the requirement.

Mr. Houser pointed out that in another portion of the Manual, "buy boats and buy trucks" were classified as shellstock shippers, consequently his suggestion was already applicable.

Mr. Van Derwerker read the proposal as it was now proposed to the Workshop:

> "This item will be satisfied when each shucker-packer, repacker, shellstock shipper, or reshipper establishes and maintains a ledger record or record system satisfactory to the State control agency indicating from whom shellfish were purchased or secured; the date purchased or secured; State designated areas from which the shellfish were harvested; and the names and addresses of persons to whom shellfish were sold."

Mr. Bower inquired whether the example given for the Manual appendix, was an attempt to tie in the amounts of oysters purchased or harvested with the amounts sold by the dates of purchase or sale. He was assured by Mr. Houser that this was not the case except that the amounts purchased or harvested should relate reasonably close to the total sold at the end of the month. Mr. Bower felt that this still would not provide an indication of what areas the oysters came from. Mr. Houser indicated that by looking at the plant record and noting the areas harvested control officials would have a better idea in which harvesting area the problem existed. Knowing this quickly, the State would close the immediate area and the rest of the industry within the State would continue to operate as usual. Mr. Bower commented it would cost the industry money to keep these records. Mr. Houser agreed that it might cost something but that we had to devise some method of tracing through records the area from which shellfish were harvested and the person who harvested them. Mr. Bower suggested that the matter of records should be left to the States as they had some capabilities in the matter. Mr. Houser replied that this had been considered very seriously after the Olympia meeting with his group since Mr. Bower had suggested it at that time, but that his proposal would lead to misunderstandings and disagreements between the Public Health Service and State personnel when we evaluated their programs annually as to what the States should require. Mr. Bower inquired if there would be standardized form as proposed for Appendix B of the Manual which they would be expected to fill out. Mr. Houser said this would be up to the State people as the words were "ledger record or record system satisfactory to the State control agency," and that the Public Health Service would point out any deficiencies in their annual evaluation.

Mr. Gregory commented that when Virginia had tried to require "buy boats" to maintain records of the tongers from whom they purchased, it had failed. Mr. Houser replied that we were only asking for good records by the dealers and that where good records were not available, it usually resulted in more areas being closed than perhaps was necessary as in some situations it had been proposed that all of a State's certificates be cancelled immediatly because of the inability of the State through lack of records to be able to pinpoint quickly the source of the disease outbreaks.

Mr. Caldwell commented that North Carolina had been using this type of record system for some time and had found it created no undue hardship on the dealer. He pointed out that the record system supplied by the dealer provided a means for their Commercial Fisheries to collect their taxes as well as provide the information needed by the State Health Department.

Mr. Dana Wallace indicated that in Maine the record system had provided them with valuable information as to number of people employed, amounts harvested, value of industry product, etc.

Mr. Harrison pointed out that it would be most difficult for the buy boats to obtain names of tongers with 20 tong boats tied up on each side of the "buy boat" and with the wind blowing. Further, that the industry is not a wealthy industry and is mostly made up of small one man-operations. He felt that area indentification would be sufficient, and there was no need for customer identification.

Mr. Jensen pointed out that in a recent outbreak of hepatitis, one of the intermediate handlers had good records. These records made it possible to recover the oysters, so that no blanket prohibition on shipments from the area was necessary. He pointed out that having such sales records constitutes a big insurance policy for the industry.

Dr. Mosley indicated he seconded Mr. Jensen's views and that the record-system proposed was based on practical experience with attempting to trace shipments in both directions, had not been arrived at arbitrarily, and was the kind of information needed from a practical point of view. As far as cost to the industry was concerned, he indicated it was worth mentioning what happened to sales in 1961 when information about Raritan Bay became known to the public. If records had been available as to where the clams came from and to whom sold, the contaminated shellfish could have been removed from market channels without alarm to the public. He also pointed out the cost of investigating the incident, and that 12 to 15 people were required over a period of several months, is of interest to the industry as taxpayers. He felt that the additional cost to the industry caused by a requirement to keep more adequate records would be well repaid through protection of sales.

Mr. Van Derwerker pointed out that a fundamental concept of the cooperative program since 1925 was to be able to trace shellfish from source to destination. The alternative, he said, would be to condemn the whole industry in a State rather than to pin down the actual source, and identifying the individual harvesting from a polluted area.

Mr. Morgan indicated that he thought it imperative to be able to trace shellfish back to their source. He favored the keeping of records to avoid closing the whole industry down within a State, and indicated that he did not know of any other way to do it than by requiring adequate records, a procedure that a State agency could enforce, and suggested the proposal be adopted as read.

Their being no further discussion of the proposal the Workshop was shown to be on record as adopting it.

SECTION C

PACKING AND SHIPPING SHELLSTOCK

12. Suggested Change, Page 23, Section C: That a new item No. 3 be added after item 2 on page 23 which would delineate requirements for shellstock sorting or culling benches and of floor construction if used for sorting or culling shellstock. This would require a revision in the Shellstock Shipper Inspection Form, a copy which is attached. The proposed wording for this item appears below:

    3. Construction of Sorting Benches, Tables, and Floors.-- The tops of shorting benches and tables and contiguous walls to a height of at least 2 feet above the bench top, shall be of smooth, concrete, corrosion-resistant metal, or other durable, non-absorbent material, free from cracks, and so constructed that drainage is complete and rapid and is directed away from the stored shellfish. Floors, if used for sorting shellstock in shore establishments shall be constructed of concrete or other material impervious to water, and shall be graded to drain quickly, shall be free from cracks and uneven surfaces that interfere with proper cleaning or drainage, and shall be maintained in good condition.

Satisfactory compliance.--This item will be satisfied when:

a. Sorting benches and tables to a height of at least 2 feet above the bench tops or table tops are of smooth, concrete, corrosion-resistant metal, or other durable, non-absorbent material, free from cracks.

b. Benches drain completely and rapidly, and drainage is directed away from any shellfish on the benches.

c. Sorters' stools have no attached padding, and are so constructed as to be easily cleaned.

d. Floors in shore establishments used for shorting shellstock are of smooth, concrete, or of equally impervious tile laid closely with impervious joint material, or of metal surfacing with impervious joints, or of any other material which is equivalent to good quality concrete; and when such floors are maintained in good repair.

Mr. Bower commented that he had instructions from the Olympia Oyster Growers Association to register disapproval of the proposal as it would have application to culling tables for Olympia oysters which are sometimes floating houses. He suggested the proposal be changed to apply only to clams which gape since there would be no reason to apply it to species which did not gape such as Olympia oysters.

Mr. Girard concurred with Mr. Bowers saying that cullingtables for Olympia oysters met the State Health Departments requirement that they be of cleanable design. Mr. Girard indicated he could agree that a gaping clam such as their razor clam could lend itself to contamination and suggested the proposal be deleted or reworded so that it would apply only to the gaping species.

Mr. Hobbs indicated that Maryland opposed the proposal since that State used monitors for culling, and these were entirely satisfactory.

Mr. Houser indicated that in view of the opposition to this proposal, he would be willing to withdraw it if this was satisfactory to Mr. Jensen. Mr. Jensen indicated "it was", so the proposal was withdrawn.

13. Suggested Change, Page 22, Section C: That item 25, "Refrigeration of Shucked Shellfish be added to the requirement columns under the words "Item No. in Section B" in Table 11.

Discussion: This item is recommended for inclusion in Table 11 as it is the practice in some areas for shellstock shippers to distribute shucked shellfish as received from certified shucker-packers. It would require that if shell stock shippers buy and sell shucked shellfish, they must provide refrigeration equal to that required of shucker-packers.

Recommendation: That the Workshop endorse the above for inclusion in Table 11.

Workshop action: The proposal was adopted without further discussion.

14. Suggested Change, PHS Shellstock Shipper Inspection Form 769-3: That the Shellstock Shipper Inspection Form be reviewed to include an item 3 entitled "Construction of Sorting Benches" which has been previously discussed in change No 12, to include the refrigeration requirements for shucked shellfish if handled by shellstock shippers; and to include provision for use of the form to inspect reshipper operations. A copy of the revised form is attached.

Discussion: This revised inspection form now includes an item on construction of sorting benches, an item for refrigeration of shucked shellfish and provision is made to use a portion of the form for inspection of reshipper operations.

Recommendation: That the Workshop endorse this revised inspection form for shellstock shippers and reshippers.

Mr. Houser pointed out that withdrawal of proposed Change No. 14 above automatically withdrew that portion of the proposal related to "Construction of Sorting Benches" but not the portions dealing with refrigeration for shucked shellfish if handled by shellstock dealers and revision of the inspection form to cover reshipper inspections.

Workshop Action: The proposal was adopted without further discussion.

SECTION E

14. Suggested Change, Page 25, Section E: That Section E be reworded to emphasize the desirability of more States using the reshipper classification. It is proposed that Section E be reworded as follows:

> ## SECTION E
>
> Persons who reship shellfish from certified shellstock shippers, shucker-packers, or repackers to other certified shippers or to final consumers should be licensed and certified as reshippers. Use of this shipper classification is left to the option of the State.
>
> (A reshipper is not permitted to shuck shellfish, nor to repack shucked shellfish.) Requirements for a reshipper depend upon the type of product handled and the methods of operation. If shellstock are handled, the applicable requirements outlined for a shellstock dealer must be met (Sec. C).
>
> If only shucked shellfish are handled, the required items are:
>
> 1. Section B, Item 19 - SOURCE
> 2. Section B, Item 25 - REFRIGERATION
> 3. Section B, Item 27 - RECORDS

Mr. Keyes commented that he objected to the proposal. In Florida, he said, they have in the neighborhood of 1200 trucks which travel through the upper west coast each week and pick up shellfish in Georgia and Alabama. A great part of the oysters that have been shucked in gallon cans are sold to truck peddlers who pick up oysters from anyone they can buy them from. The trucks cross the State line to Georgia and Alabama and sell the shellfish to whoever will buy them. Mr. Keyes felt it would be impractical to license such truckers as reshippers.

Mr. Houser pointed out that the words were "should be licensed" which did not require action by the State but did constitute a recommendation.

Mr. Girard indicated that he thought that the use of the words, "Use of this shipper classification is left to the option of the State," is unwise as the Cooperative Program is oriented towards the growers and packers and involving wholesalers and brokers does not materially add to the sanitary control of shellfish. He moved that it be deleted.

Mr. Houser indicated that Mr. Girard had made a motion to delete the proposal and asked if anyone would support Mr. Girards proposal. There being no response, he asked how many wanted to accept the proposal to which there was also no response.

Mr. Hansell expressed concern over the fact that truckers are picking up oysters in one State and peddling them in another State without sanitary control over refrigeration and other sanitary aspects.

Mr. Jensen pointed out that what Mr. Keyes had said constituted a very good argument for taking out the portion concerned with "leaving it to the option of the State" and making it a mandatory requirement.

Mr. Caldwell indicated that in their cooperative program with Commercial Fisheries, both agencies felt that anyone who is a dealer in selling shellfish should be licensed and that this should apply to any base from which the truck is operated. He further pointed out that if a loose truck is picking up oysters and keeping no records, then we are all in trouble if there is a disease outbreak. Mr. Caldwell expressed the view that if a North Carolina truck is going into Georgia or Florida, it should be licensed in North Carolina, and if it is a Georgia truck it should be licensed by Georgia, etc.

Mr. Wallace said the State of New York already licences such people and that they believe it to be necessary as a central part of the whole system of record keeping as discussed earlier by Dr. Mosley.

Mr. Sarraf, on being asked by the Chairman to comment, indicated that Pennsylvania does not use the reshipper classification but would favor making it mandatory after extensive study as to all that would be involved.

Mr. Keyes inquired why the reshipper should be licensed when they had the records of packers. It seemed to him to be a duplication.

Mr. Jensen referred to the outbreak of hepatitis which he had mentioned earlier. In this case, the oysters were sold by a shucker-packer to a reshipper who was a broker. Fortunately, the broker had excellent records which enabled a tracing of individual shipments quickly, and two things became evident. One, in order to limit the degree of public concern over the problem, because it was soon evident that it was not necessary to close down the entire oyster industry of the Gulf Coast. Two, to provide valuable information to enable the epidemiologists to identify two other small outbreaks which occurred in Mobile and Troy, Alabama, and thereby help to explain the outbreaks which had taken place.

Mr. Gregory pointed out that the Workshop could spend the greater part of a day defining what a reshipper might be. He then indicated the State of Virginia does not propose to have their packers receive shellfish for processing from out-of-State other than directly from certified shucker-packers or shellstock shippers. He said that brokers or wholesalers, acting as reshippers, would not meet the stipulation.

After some slight further discussion the Workshop adopted the proposal as presented.

The Workshop then adjourned for lunch at 12:55 p.m.

Thursday Afternoon - November 19, 1964

Mr. Edward Gruble, Chairman

The Workshop reconvened at 2 p.m. with Mr. Edward Gruble, Vice President, Hilton Seafoods Company Seattle, Washington, as Chairman. He noted the importance of the subject of the afternoon session which was "Use of Chemicals on or Near Shellfish Growing Areas" and indicated that the use of pesticides in increasing quantities was of considerable concern to the industry and to the public. From the industry viewpoint he urged that State agencies monitor growing waters, and keep adequate records so that pesticide tolerance levels could be established, which levels might "be lived with" by the industry. Mr. Gruble then read a resolution pertaining to pesticides which had been written by Dr. Litsky for adoption by the Workshop. The resolution was as follows:

Resolution pertaining to pesticides presented November 19, 1964 to the 1964 Shellfish Sanitation Workshop, Washington, D. C.

Resolved that this Workshop go on record as:

1. Recognizing the potential problem of pesticide residuals in shellfish and shellfish growing areas.
2. Urging that a concerted effort be made at local, State and Federal levels, research experiment stations, shellfish associations and other groups for a program of research, monitoring and data collection pertaining to methodology of quantitative and qualitative analysis of the various species of shellfish, and shellfish growing areas in an attempt to advocate realistic and reliable tolerances.
3. Urging that these data be submitted to a central office, for review of reliability, and statistical analysis. These reviews are to be sent to all interested parties at regular intervals.
4. Requesting that a report of these activities be prepared by the Shellfish Sanitation Branch, PHS and presented at the next Workshop.

Mr. Hollis said that he heartily endorsed the resolution presented by Dr. Litsky. Mr. Jensen also endorsed Dr. Litsky's resolution and stated he had already discussed the problem of tolerances with the Food and Drug Administration and that he had high hopes such tolerance would soon be established. He pointed out that adoption of the resolution by the Workshop would be helpful in pinpointing a need.

The Workshop then unanimously adopted the resolution as written by Dr. Litsky and read by Mr. Gruble.

Mr. Allen proposed that the Public Health Service develop a management or procedural system for future Workshops. There being no opposition to Mr. Allen's proposal Mr. Jensen said he assumed the applause meant concurrance by all participants and that the Public Health Service would try to move on it as rapidly as possible, and that "it might end up as an advisroy committee to the National Shellfish Sanitation Program."

Mr. Jensen then introduced the subject of the review of Part III of the Shellfish Sanitation Manual which constituted a method for evaluation of State Shellfish Sanitation Programs on an annual basis. By way of introduction, Mr. Jensen read the first two paragraphs of a paper prepared by Mr. William A. Felsing entitled "Suggested Changes for Part III - Public Health Service Appraisal of State Shellfish Sanitation Programs". (Mr. Felsing's complete paper is included in these Proceedings as Appendix Z.)

Mr. Jensen reviewed the development of the appraisal procedure and explained that field usage has disclosed relatively few areas of weakness or inadequacies. He also noted that numerous discussions with the State shellfish control agencies have revealed that there is also general satisfaction, but that a few States had expressed concern over low ratings obtained in several of their program elements, although concurring with the Public Health Service these program elements were weak and needed strengthening. In several instances, the low ratings tended to be a reflection of the transitional phase of adopting the State program files to the procisions of the new appraisal system and were not necessarily a reflection of serious program deficiencies.

Mr. Jensen then inquired whether anyone had any comments on the general philosophy of the use of Part III before he went into the details of the proposed changes.

Mr. Hobbs objected to consideration of Part III at the Workshop. He pointed out that its bulk did not enable one to fully absorb its complete meaning. He suggested it be considered at a subsequent meeting.

Mr. Jensen indicated he could not agree with Mr. Hobbs proposal inasmuch as it would put the Public Health Service in the impossible situation of not having an approved system of conducting State program appraisals. He also explained that Branch staff had met with all States including Maryland and Virginia, and discussed the procedure in detail. He stated the Public Health Service viewed the procedure as a significant step forward which would help pinpoint deficiencies in State programs.

Mr. Girard asked whether Mr. Jensen would agree to the continued use of Part III on an interim basis until the next Workshop.

Mr. Jensen indicated he was not in favor of this as it would leave the Public Health Service without definite performance standards for another three years.

Mr. Gregory commented that at the Maryland, Virginia, North Carolina meeting it was the consensus that Part III in its entirity should not be brought before the Workshop for approval but only the items which were to be revised. He also pointed out that at their meeting it was their view that evaluations should be made only by competent and experienced personnel and only if the evaluations were uniformly enforced. Mr. Gregory further felt that the Workshop was not the place for matters of such a broad scope to be presented for adoption since many attending the Workshop had no responsibility for, and little concern, for State programs. He suggested that a representative group of State officials be selected for this purpose.

Mr. Jensen replied that Part III provides the uniformity mentioned by Mr. Gregory. He also agreed that both the Public Health Service and the States had difficulty in obtaining competent and experienced personnel, and that the Public Health Service had not refused to work with any States because of the lack of graduate oceanographers or engineers with advanced degrees on their staffs. As for the Workshop being the proper place for consideration of Part III, Mr. Jensen said the Workshop was approved by the Association of State and Territorial Health Officers, an advisory group to the Surgeon General, and there is no higher group to which the matter could be appealed.

Mr. David Wallace indicated that after a caucus of the Region II States it was their unanimous opinion that Part III should be adopted just as it is, as he suspected there was not a person present from a State control agency who had not studied it and debated the various items at length. He further explained that there was no point in arguing the details as all States including New York might object to certain items, but that the Part III was and constituted a big step forward. He recommended adoption in toto.

Mr. Sarraf seconded Mr. Wallace's recommended proposal as presently written.

Mr. Harrison objected on the basis that all States had to live with Part III, and it should be given closer consideration.

Mrs. Wallace said that if Part III were adopted by the Workshop at this time, and certain weaknesses were found during its use, these could be easily corrected at the next Workshop.

Mr. Stringer indicated he agreed with Mrs. Wallace that although the documents were not perfect, it could be revised by the next Workshop, and further pointed out that if the founding fathers had gone through this many revisions in writing the Constitution it would never have been completed.

Mr. McIntyre commented that he had used Part III in evaluating 3 State programs on the West Coast and that he had found it most useful in making uniform evaluations among those States.

Mr. Jensen inquired of Mr. Edmonds if adoption of Part III would cause the Government of Canada to lose confidence in our control program

Mr. Edmonds replied, "no", he thought it desirable that a uniform procedure be used, that he was not sure how this appraisal technique would affect their program, and that we should work toward a uniform technique.

Mr. Allen commented that the only way you purchase a pair of shoes is to try them on and if this particular pair of shoes does not fit you will hear plenty of squeaks from the State. He indicated most of those in attendance would go along with it as it is, with the reservation that they had the right to express themselves at the next Workshop if it does not work out.

Mr. Jensen said as he understood it Mr. Wallace's and Mr. Allen's proposal would include the minor changes proposed in Mr. Felsing's paper. Mr. Wallace indicated this was understood.

Mr. Willerford inquired if a report was available on the effect of past usage of Part III. Mr. Jensen indicated that this information was in Mr. Silva's paper also given at this Workshop.

Mr. Brinsfield said he understood two people from Region III had spoken (Mr. Hobbs and Mr. Harrison) in opposition to the proposal and he wanted to reiterate what they had said. He expressed fear that Workshop participants would gradually leave and then some items would be rushed through at the last moment. Mr. Brinsfield indicated he was perfectly satisfied to have proposed changes in Parts 1 and 2 whipped through but he did not think there had been time or would be time to complete discussion of the proposal. He further felt this was a very important matter and should be studied in further detail and brought up on the floor at this time.

Mr. Jensen pointed out for the record that this proposal had been well distributed before the Workshop and that practically all coastal States were still represented at the Workshop. He then listed those States presently represented which totaled 21 of the 22 coastal States, exclusive of New Hampshire which had not sent a representative to the Workshop, and in addition included representatives from Canada and Japan. Mr. Jensen asked those for adoption to stand and those opposed to do likewise. He indicated after the count that all the States and the industry except Maryland and Virginia favored adoption. He also indicated that as far as the Public Health Service was concerned that they would continue to use Part III as revised by Mr. Felsing and that the record would indicate that the States of Maryland and Virginia object to use of it.

Mr. Brinsfield remarked that Maryland did not object to the use of it.

Mr. Gregory commented that they objected to the way it was adopted.

Mr. Jensen inquired what would their proposal be as a course of action?

Mr. Gregory said he had not given this a great deal of thought but he thought another series of Regional meetings between the Public Health Service and State control agencies would be helpful.

Mr. Jensen said PHS representatives had met with the States of Virginia and Maryland and had arrived at a few minor changes but that nothing could be accomplished in meetings with the other States since they had already approved it. He further indicated that he thought Maryland's and Virginia's interest was protected by the record which would show their objection to the manner in which it was adopted. He then asked Mr. Gregory if he would object to receiving shellfish from a State whose program is evaluated by Part III.

Mr. Gregory indicated he would have no objection to the receipt of such shellfish in Virginia but wanted to repeat his objection to the way it was being put before the group for adoption and felt that there were many people present who were not responsible for State programs.

Mr. Jensen then had a roll call read. The States of Maine, Massachusetts, Oregon and Louisiana were all in favor of the proposal. Mr. Girard indicated he doubted if there was sufficient time for a roll call of the States as he had a plane to catch during the weekend. Mr. Jensen said he was only trying to show that the decision being made was by a group who were responsible for State shellfish sanitation programs.

Mr. Harrison indicated he represented the Chesapeake Bay Seafood Industries Association and that the record should show that they also opposed the adoption of Part III.

Mr. Fisher commented that he was beginning to be sorry he came to the Workshop because prior to this meeting he had some confidence in the program. Now he was shaken, he said, because in the discussion on bacteriological standards he was informed that the shellfish were coming from approved sources and that this meant that the State programs were under an effective survey program of the Public Health Service. He pointed out that unless there is a standard method of conducting surveys, such surveys do not mean much. He further indicated that he felt if the products were produced for the benefit of Indiana consumers, that a standard method of checking on the sanitation of the production was necessary. He suggested that we had an interim bacteriological standard which was now changed to a full-time standard and that the same should be done here with the appraisal requirements.

Mr. Brinsfield commented that he wanted to assure Mr. Fisher and everyone else that although Maryland had not officially adopted Part III because there has not been time to satisfactorily go through it, that they would be guided by, and he was sure they would be evaluated by Part III, so Mr. Fisher need not be concerned by their actions.

Mr. Jensen indicated that he wanted to assure Mr. Gregory and Mr. Brinsfield that the Public Health Service would expect to work just as closely as possible with their States and that the Public Health Service would expect to use Part III in evaluating all the States programs.

Mr. Gruble then explained that the afternoon speakers had been excused since it was anticipated that the session on Part III would take most of the afternoon. However, he noted that Mr. Stringer was still present but had indicated he would pass with regard to his presentation on pesticides.

Mr. Stringer indicated he would like to make one statement with regard to work the Bureau of Commercial Fisheries has been doing with a chemical compound to control shellfish predators. He said they were reaching the stage where it was thought the chemical might be applicable in certain areas. They did not intend to recommend the use of the compound until they had discussions with the States as to where in particular areas it might be used in perfect safety.

(Note: Apologies and regrets are extended to the speakers who were unable to make their presentations due to the Workshop operating behing the anticipated schedule.)

(Mr. J. Richard Nelson's paper on the Use of Chemicals On Or Near Shellfish Growing Areas - An Industry Viewpoint is presented in these Proceedings as Appendix AA.)

(Mr. George Vanderborgh's paper on the Industry Viewpoint of the Use of Chemicals On Or Near Shellfish Growing Areas is presented in these Proceedings as Appendix BB.)

(Dr. Milton J. Foter's presentation on the Use of Chemicals On Or Near Shellfish Growing Areas - The Public Health Service Viewpoint is included in these Proceedings as Appendix CC. Due to the illness of Dr. Foter, his paper was prepared and was to have been presented by Dr. Herman F. Kraybill, Pesticides Program Officer, Bureau of State Services, U. S. Public Health Service, Washington, D. C.)

Mr. Gruble commented that the industry looked to the States, the Public Health Service, and those other agencies charged with protecting public waters to do an effective job. He felt that a good monitoring program was essential and must be carried out so that it may be possible to judge what the conditions are at the present time. He indicated the industry is concerned with the increasing amounts of pesticides being used in agriculture and in the prevention of forest predators which, in one way or another, get pesticides into shellfish growing waters.

Mr. Bower indicated that he would like to make a statement for the record on behalf of the oyster industry. He said that the State people in the State of Washington have a good program for evaluating the use of pesticides, and that the Federal people had been perusing very properly and very carefully the use of pesticides for predator control on oyster beds. He wished to reiterate the industry's desire that the Federal Review Board be very cautious in authorizing or helping finance any spraying of uplands without very careful consideration being given to the effect on marine lands where the run-off will affect them. He also suggested that if possible any experimental program such as the Hemlock project in the State of Washington should be handled with a more objective reporting of the results. It was indicated the program took place sometime ago and a report on the actual effects is not available. The report is in the Washington State Department of Natural Resources. He said he hoped that the Federal people as well as any of the State people who have anything to do with it, would lean the other way and be careful that water resources are not damaged.

Mr. Gruble pointed out that the Workshop had sufficient time if Mr. Kelly wanted to conclude the Workshop with his report on the Shellfish Sanitation Centers.

Mr. Kelly commented that he would not impose his thoughts on research on the Workshop at this time as he thought most of those present were acquainted with the research program, and if not, he urged them to visit the Centers. He offered, however, to answer any questions about the research program.

There being no further questions, Mr. Gruble adjourned the 1964 National Sanitation Workshop at 3:06 p.m.

APPENDIX A

OPENING REMARKS

By

Harry G. Hansen, Assistant Surgeon General
Associate Chief for Environmental Health
Bureau of State Services
Public Health Service

For the Surgeon General, for the Public Health Service, for all of us who are interested in the subject of shellfish sanitation, I welcome you to the Fifth National Shellfish Sanitation Workshop. I want to particularly welcome our Canadian and Japanese colleagues here with us today. Their presence lends an international flavor which is most gratifying. Whatever we can do to make your visit with us pleasant, we wish to do.

At the previous Workshop in 1961 the attendance was 148. I am told that the registration so far this time is over 160. The fact that so many of you are concerned with shellfish sanitation problems, and have responded so well to our invitation, is indeed heartening to us.

Ninteen sixty-four is the 40th year of the operation of the Shellfish Sanitation Program. This fact reflects well the durability and soundness of the original program concepts. Although shellfish sanitation problems continue on the increase, I am certain that perseverance and cooperative effort will enable us all to find the answers.

We believe these Workshop meetings are important because they provide a forum in which effective program guidelines may be established. These guides are useful and necessary. Prior to the last Workshop, there were two serious hepatitis outbreaks which were associated with the consumption of shellfish. Again, prior to this Workshop, we have learned of two more serious hepatitis outbreaks attributed to the eating of shellfish. These outbreaks indict the product, cause consumers to suffer, and result in considerable economic loss to the industry through the loss of consumer confidence in the product.

I hope that all participants here today will view the program changes which are to be recommended in this Workshop as being in the total interest of everyone concerned with the program and especially of the consuming public. It is also my fervent hope that this Workshop will try to devise ways and means of preventing further such outbreaks.

Such unfortunate incidents not only cause a loss of consumer confidence and result in adverse publicity, they also may give rise to a questioning attitude toward the basic concepts of the program itself. I personally believe that there is the talent and know-how in this room to prevent more of these outbreaks, and I hope we will be able to do just that in the future. You can be assured that the Service wants to do its part.

In the development of the Cooperative State-PHS-Industry Certification Program, the States and the industry have accepted the mutual responsibility of assuring effective sanitary control of shellfish production. The entire program depends upon how well this responsibility is carried out. The responsibilities of the Public Health Service under the program are to assure that State programs are operating satisfactorily and that they merit Public Health Service endorsement.

In actual practice, the foregoing means that the Service must review each State program annually. It is expected that all the States will continue to cooperate fully with us in these reviews, and that each State will carefully document its shellfish program as to leave no doubt that our endorsement is warranted. If the State programs are defective, and if defects are not reported and corrected, the whole program is jeopardized, because the entire cooperative program is based on the fundamental concept of mutual confidence. The fact that we must all operate with full and complete exchange of information is central to the development of an awareness of the true status of the entire control effort.

Speaking for myself, and as an official of the Public Health Service, I do not believe we should be a party to a voluntary Cooperative Program unless we have every confidence that there is a sincere and frank exchange of information in each State concerned, and that this exchange is on a fully cooperative basis. This is another reason we believe conferences of this type are so important. Here is where we lay the problems on the table, openly discuss them, dissect them and, if you will, hopefully work out mutually agreeable measures.

I would like to recall something Dr. Anderson said at the 1961 Workshop. That is: "I do not want to feel that the Public Health Service is putting interstate certification tags on shipments of shellfish moving from one State to another--in effect, giving shipments a Public Health Service stamp of approval--if I have any knowledge that program people in our Regional Offices or the Industry or the States feel there is a danger to public health. To do this jeopardizes the public and will damage the good name of everyone concerned in the program."

At the last Workshop, Dr. Anderson also had the pleasure of telling you that the Congress had just appropriated funds for the establishment of two new shellfish sanitation research centers; one to be located at Narragansett, Rhode Island, and the other to be located at Dauphin Island, Alabama. As most of you have learned by now, these facilities have been constructed and are now functioning. Later in this Workshop you will hear status reports on the activities under way in these Centers, and on activities conducted in the research facility we operate with the Washington State Department of Health at Purdy, Washington. I am confident that these three facilities will contribute in substantial measure to the effectiveness of the program.

I also note from the program that there will be a discussion of the depuration process in the safeguarding of shellfish sanitary quality. We have long needed a means of purifying shellfish--which, as you know, frequently is consumed raw--some new process, perhaps comparable in effect to the pasteurization of milk or the safeguarding of municipal water supplies. While depuration, like many other processes is not perfect, it nevertheless should be encouraged as a public health measure offering additional protection to the consumer. I hope the subject will have adequate consideration in the plans of each State in the future.

You will be interested to learn that the Department of Health, Education, and Welfare is on record as declaring that the Shellfish Sanitation Program needs additional strengthening. This declaration is found in an "Analysis of Current Problems and Proposed Corrective Actions" submitted by the Department to the House Subcommittee on Fisheries and Wildlife Conservation of the House Merchant Marine and Fisheries Committee.

The Analysis reports that this 1964 Workshop is to be held and that, through the Workshop, technical or administrative changes needed in the program will be determined. The Analysis also points out the need for a National Register of Shellfish Growing Areas and states that we hope to have such a register fully operational by fiscal year 1966. The Analysis further indicates that there also is a need for the correlation of shellfish sanitation and pollution prevention abatement objectives, both at the State and the Federal level, and that more effort is needed to assure that shellfish imported from other countries is equal in sanitary quality to domestic products.

I sincerely hope this Workshop will be successful in working out the many administrative and technical problems facing the industry. I am sure that it will be productive; and, although we may not solve all of our problems today, the important thing is that we get started and approach them in a spirit of cooperation. May success crown our endeavors.

APPENDIX B

INDUSTRY STATUS REPORT

By

Elizabeth M. Wallace
Oyster Institute of North America
Sayville, Long Island, New York

We, the industry members are here to deliberate with the various State agencies and the Public Health Service to tailor the Shellfish Sanitation Program to the current needs of the molluscan industry. That modifications are needed, or that re-evaluation is necessary, should not be a surprise to anyone. In this world the greatest constant is change. To fail and to fail to adjust to these changes in any realm of our endeavors is to be obsolete.

The threatening prime factor in our business is the long, continuing, and recently precipitous decline in the all over production of clams and oysters. With demand exceeding the supply, there is a temptation to take species from uncertified waters or to otherwise short circuit the regulations established to guarantee a safe food. Unfortunately, our inquiries reveal that this decline will continue, in this year at least. But it need not be so forever. Advances in molluscan culture can be accelerated--launched by the emerging knowledge of the therapeutic values of molluscan meats. We can here and now resolve to face the current difficulties, solve them, and at the same time prepare for a splendid future.

Why can't we frustrate those who are unscrupulous to attempt to sell polluted shellfish? With the knowledge of our waters and of the habits of our neighbors, the industry as a partner with the State agencies can forbid markets to these opportunists. At the same time let us improve the quality of producing waters or remove the shellfish from those waters. The South Jersey Shellfishermen's Association organized themselves to do just this. Even more, they are making a frontal assault on the sources of domestic pollution and by persuasion and political pressure, leading the various municipalities to rectify local sources of contamination. Maryland, having been caught by encroaching pollution met the disaster to the oyster industry when Governor Tawes appointed an Expediting Committee, of which our own president was a leading member, which organized all of the concerned State agencies and the industry itself to eradicate the major source of pollution with sufficient success to reclaim as a right now 70 percent of the aquatic resource. We hope these beneficial trends continue in all of the States and all take heed of what happened in Maryland and not let it happen to them. We hope these beneficial trends continue. With our membership in 20 coastal States and distributing members in many interior ones, we request and indeed insist that the needs of the shellfisheries be included in the comprehensive planning of the uses of estuarian waters. We are ready right here and now to do whatever is needed to upgrade water pollution control to a position of sufficient stature to achieve results.

We were happy to hear the remarks that this has been launched and is progressing, and we pledge our wholehearted cooperation to these endeavors.

Our group, of course, is not the only group dedicated to the proposition that the water problem of this country must be resolved at a more accelerated rate than has been accomplished in the past.

One other aspect of the current trend is the shifting of the distribution patterns of shellfish. In general, as the supply has dwindled in the North, they have been supplanted by shellfish coming up from the South. The expanding distance between the growing waters and the eventual markets with the gypsy transport freighter, this, too, must claim our attention because the temperature factors involved in the operation work inversely to follow heat controls.

We support and urge State agencies to rigidly survey--have a surveillance program of all shellfish coming into their State, so that we will create economic pressure whereby we cannot afford to be negligent in this area of quality control.

The minimum wage hour law has worked hardships in certain States, putting additional pressure on the industry to buy the cheapest product possible. We are working hard to find better ways and means of opening shellfish to help alleviate this situation. We having the privilege of supplying a wonderfully nutritious food to the consumer, we must assume the responsibility of cooperating together with all the agencies to make the Shellfish Sanitation Program successful.

APPENDIX C

The Cooperative Program for the Certification of Interstate Shellfish Shippers
An Annual Report
FY-64

By

Frank J. Silva
and
Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

In a few months, the Cooperative Program will be 40 years old and it shows every promise of living up to the adage that "life begins at 40." Instead of a senile, decaying program, we have one that is rapidly being revitalized at both State and Federal levels. We have vastly improved Federal research resources and many States are carrying out research programs of their own.

True, we have administrative, financial, technical and legislative problems of varying proportion, but we feel that we know what these problems are, and that we generally know how to solve them. Therefore, we enter the 40th year of the Program, perhaps not on the threshold of the stars, but with a great deal of hope and genuine optimism for the future. Other information will be presented by other Public Health Service speakers describing specific problems and events in the Program during these next three days. Together, they will provide a reasonably good report on where we are, what we have been doing, and where we are going. All papers will, of course, be included in the published Proceedings of this meeting.

One of the most important responsibilities of the Public Health Service in the Cooperative State-PHS-Industry Program for the Certification of Interstate Shellfish Shippers is the annual review of State shellfish control programs. The purpose of these reviews is to obtain information on the adequacy of State programs in meeting Cooperative Program "standards." From the information obtained during such reviews, the Public Health Service either endorses or discontinues endorsement of the respective State shellfish control program. While the Public Health Service has been conducting State program reviews since assuming its responsibilities in the Program, the completeness of these reviews, and the uniformity of review procedures between individual States and Regions, have not been entirely ideal. These shortcomings have resulted, in part, from the lack of objective uniform guidelines for program review procedures. Predictably, States being reviewed were not hesitant to remind the Service of the need for uniform evaluation measures. As a result of this recognized need, a State program appraisal procedure entitled, Part III - "Public Health Service Appraisal of State Shellfish Sanitation Programs" of the Manual of Recommended Practice for the Sanitary Control of the Shellfish Industry was developed. After several years of developmental work, this appraisal procedure was tentatively accepted by the participants at the 1961 Shellfish Sanitation Workshop.

One of the provisions of this appraisal Manual (Section A, Item 2, Sub-Item d) charges the Public Health Service with preparation of a yearly report on the status of the Cooperative Program. The purpose of such a report is to present a statistical review of State activities, describe technical and administrative progress, and discuss current problems. This report is submitted in partial fulfillment of this obligation.

The new appraisal Manual was used for State program reviews in fiscal years 1962, 1963, and 1964. In view of the readjustments and initial difficulties associated with the application of this Manual during the first two years, this report will be confined to discussing the FY 1964 State program reviews, otherwise considered as the 1963-1964 shellfish season. The use of the appraisal procedure for FY 1964 produced greatly improved uniformity in State program evaluation procedures, and resulted in an increase in program review detail. It represented an almost complete transition from previous subjective evaluation measures to a more-objective, detailed procedure, and was effective in focusing attention on those program components requiring attention and upgrading. The evaluation procedure was broken down to review the eight identified program elements of the States' programs, namely, Administrative Procedures, Laboratory Procedures, Sanitary Survey, Relaying, Purification, Patrol, Harvesting, and Shucking-Packing.

During FY 1964, there were an average of 1,250 shellfish shippers listed per month on the Interstate Shellfish Shippers List. Twenty-two issues of this list were printed and distributed to approximately 4,000 persons. Approximately 300 shucker-packers and repackers were inspected with the weighted sanitation ratings computed to be 87.1%. Approximately 100 shellstock shippers were inspected with an overall rating of 93.5%. Of 387 identified growing areas in the United States, approximately 349 were evaluated.

An analysis of these ratings, in terms of individual Program component values, median, maximum and minimum levels is presented in Tables 1., 2., and 3. (attached). Names of States have not been identified with the individual ratings.

In FY 1964, all 23 State shellfish sanitation programs were evaluated according to the appraisal Manual procedures. A final rating was established for every State although in a few States reviews for all program elements could not be completed. The appraisal procedure requires that each individual element of a State program rate at least 70% in order to be considered as minimally satisfactory. Table III lists the degree of compliance with this requirement in the eight individual program elements. Of the 23 States evaluated, 19 had final ratings greater than 70%. The highest rating was 100.0% and the lowest was 54.4%. The median value for all States was 84.8%. Twelve States had no program element rating less than 70%, four had one element less than 70%, five had two elements less than 70%, and two had three element ratings less than 70%. It should be recognized that these figures represent last year's ratings. Most ratings have already been or are being upgraded. Discussions have been held with State control officials, and others are scheduled, to review serious program deficiencies and to implement those necessary plans of action leading to their improvement at a satisfactory level. We would recommend caution in the interpretation of combined final State ratings. A combined rating greater than 70% could, and has contained within it, individual elements rating less than 70%. It must be recalled that a satisfactory program requires all program elements rate 70% or better. The "combined rating" is presented only as an overall numerical indicator of quality.

It appears that the appraisal procedure has been quite effective in describing areas of program needs, both on a quantitative and qualitative basis. It is gratifying to report that in almost all cases the identification of a problem by the appraisal procedure has been followed by substantial corrective action. In some States, the effects of pinpointing areas of needed support have resulted in additional resources being made available to State shellfish control officials. This has included additions to present staffs, improved salaries, additional equipment for patrol, (such as the inclusion of the purchase of an airplane in expanded patrol plans in one State), stimulation of laboratory support and has also led toward developing cohesiveness and unity of purpose between participating agencies.

We are convinced that there has been substantial improvement in the States' programs in the past two years. However, the change in appraisal procedures makes it difficult to express this improvement statistically.

Program Expenditures

In 1962 and 1963, shellfish control officials of 22 States were contacted to determine the levels of State expenditures directed toward sanitary shellfish control. Information was obtained on current levels of expenditure, and on estimated levels of expenditure needed to conduct adequate and complete shellfish sanitation control programs. In all States, there was a gap between the two levels of expenditures, with the differences ranging from 14% to 4900%. (The latter figure is atypical due to the nature of the State's program.) The median value of needed increase in funds to conduct an adequate shellfish control program was 86%. In those States where needed expenditure increments were less than the median need, only six program elements rated less than 70%. In those States where program needs exceeded the median, there were a total of 14 program elements that rated less than 70%. Three of the four States with combined ratings less than 70% required expenditures exceeding the median need.

The necessity for additional resources enabling States to conduct adequate shellfish control programs is apparently confirmed by the positive relationship between program element compliance and current levels of expenditures.

The Public Health Service also is not without problems of personnel and funds to carry out its obligations in the Program. During the FY 1964 program reviews, some of the elements of various State programs were not evaluated in depth. This is of particular concern when such limitations affect appraisal measures of critical program elements such as sanitary survey, patrol or relaying. In addition, incomplete appraisal of all pertinent program elements results in a distorted evaluation of the State's program and presents a non-typical description of its true status.

These conditions reflect the problems of obtaining adequate PHS staff to conduct complete and accurate evaluations of State programs. As a result of these staff shortages, the Regional Office has frequently enlisted the support of staff from the Research Centers to assist in evaluation activities. However, the utilization of personnel from the Research Centers to fill in these man-power gaps has obvious adverse effects upon the Public Health Service research effort. The Public Health Service recognizes these obvious operational shortcomings and is hopeful that corrective action can be realized in the near future.

In general, we believe the appraisal Manual is an effective tool in measuring the status of State shellfish control programs. Uniformity of evaluation has been enhanced, subjectivity has been replaced by objectivity, and the procedure has been instrumental in identifying areas of program needs, not only on a State by State basis, but on a national level as well. On the whole, the Public Health Service is satisfied with this uniform guideline procedure to evaluate State programs. It is recognized that minor modifications are necessary in the appraisal procedure and these are scheduled for discussion at this Workshop.

International

During 1962, 1963, and 1964, visits were made by Public Health Service officers to Japan and Canada in connection with shellfish control measures. In October 24, 1962, an agreement was concluded between the Government of Japan and the United States which permits the entry of fresh or frozen shellfish from Japan into the United States. These products are produced under Cooperative Program requirements, and as of this writing, only one plant is currently certified. In 1963, a Branch representative met with Mexican National Health and Fisheries authorities in Mexico City to discuss that nation's shellfish sanitation program, and problems related to the export of Mexican produced oysters to the United States. Future discussions on this matter remain within the initiative of the Republic of Mexico.

Interest in shellfish exports to the United States has been expressed by other nations including Venezuela, South Korea and France. There have been numerous recent meetings with representatives of the French Government. In addition to these formal contacts the Public Health Service has had numerous inquiries from export firms in other countries relative to sanitation standards.

Epidemiology

One of the measuring sticks for demonstrating our degree of effectiveness in sanitary shellfish control is through epidemiological investigations. Through these techniques we can determine if shellfish were or were not involved in any disease outbreak, and also identify program weaknesses and special problems in those events where shellfish may have been involved.

Since the last Workshop, the Cooperative Program has experienced several disease outbreaks attributed to consumption of insanitary or toxic shellfish. In December 1962, several persons became ill after eating shellfish from a non-polluted area in a Gulf State. The nature of the illness was expressed by symptoms closely resembling paralytic shellfish poisoning, e.g., numbness in extremities, loss of coordination and general reaction upon the central nervous system. Subsequent investigations revealed that the shellfish became toxic during periods of a Red Tide occurrence and that such events were well-known to local fishermen. This event resulted in closure of several shellfish growing areas, required additional surveillance control measures by the States and brought to focus a new problem in the sanitary control of shellfish in the United States.

One non-fatal outbreak of typhoid fever involving several persons was related to shellfish handling. The epidemiological evidence suggested that the shellfish had been contaminated in shallow growing waters prior to harvesting by overboard fecal discharge from a harvester, who was subsequently found to be a typhoid carrier. One of the victims who had eaten shellstock harvested by the carrier was found to have the same unusual S. typhosa phage type as the carrier. It is significant to note, that as a result of this incident, the State instituted a typhoid carrier screening program for all shellfish workers, including harvesters. The screening program has been demonstrably effective by picking up an additional typhoid carrier who was immediately excluded from harvesting.

In another event, in a New England State, Salmonellosis was attributed to shellfish harvested from a highly polluted, posted area, by private individuals gathering shellfish for their own use.

Incidents of infectious hepatitis related to the consumption of insanitary shellfish continues to be a most important problem in sanitary shellfish control. Last winter, epidemiological investigations revealed that approximately 250 cases of that disease were linked with the consumption of shellfish that had apparently been harvested from unapproved waters. This widespread event received considerable press attention and resulted in substantial depression in shellfish sales. The economic impact associated with those affected persons in lost time, medical bills, etc., also is not without recognition. This problem continues to be one of substantial concern to the program, not only as a public health matter, but as to its related impact upon the shellfish economy.

The above incidents offer ample evidence of the variability of epidemiological problems associated with sanitary shellfish production. Through epidemiological findings, specific program weaknesses have been demonstrated and hopefully out of these events corrective action can be planned accordingly. It also reaffirms the need for State control authorities to participate actively in epidemiological investigations to determine what action or resources may be required to avert additional undesirable incidents.

National Register of Shellfish Growing Areas

We wish that we could present accurate comparative statistics on the total number of shellfish growing areas in the United States with which we are concerned and the water quality trends in those areas. We cannot. Such information, on the whole, is simply not readily available to reflect current conditions in the United States. The need for National data to measure the pulse of our estuarine conditions has been recognized and we are pleased to report that we have made a significant start in this direction.

The development of a National Register of Shellfish Growing Areas has accordingly been initiated since the last Workshop. Eventually we hope this register will describe all active and inactive shellfish growing areas in the United States and will provide, through a comprehensive file and rapid retrieval system, a central continuous record of National shellfish growing area water quality. Although State program evaluations describe to a limited degree open and closed areas, this information is quite general and not adequate to reflect national growing area conditions. A central record of shellfish growing area conditions is essential to describe trends and behavior of estuarine quality and to provide information necessary for intelligent program planning. We hope that this data can be gathered through the participation of the producing States. Close liaison will be maintained with the Bureau of Commercial Fisheries in the application of this program in fulfillment of established interdepartmental agreements.

Depuration

The subject of depuration has gained considerable interest since the last Workshop. This process, which has long been a part of routine shellfish production in Europe, appears to be one of continuing and growing need for domestic shellfish production. Population growths, especially in coastal areas, continue to place additional pressures upon maintaining many of our estuaries as safe for shellfish production. While the need for depuration may be much less critical in areas which are obviously remote from pollution, its use, however, appears to be the only immediate solution to safe shellfish production in areas where pollution influences subjects conventional harvesting practices to substantial risks, and allows little or no margin for error. The additional health safeguards provided by depuration has its analogy in the pasteurization of milk and the treatment of domestic water supplies. In view of the problems associated with the growth of our society, and the attendant effects upon the use of estuarine areas, it seems that depuration offers a solution to the continued production of safe shellfish in marginal areas. Inasmuch that safe shellfish production is so inextricably woven into consumer acceptance of the product, the future survival of the shellfish industry may well hinge on the application of the depuration process. Additional discussions on this subject are on the Workshop program.

At present, pilot plants are located in Maine (1), Rhode Island (2) and Alabama (1). Active commercial plants are located in Maine and Massachusetts and a plant, not yet approved for operation by the State agencies, has been built in Florida; New York and New Jersey are considering study of the process; and a large "desanding" plant is being built by a shipper in Maryland.

Research

The need for additional shellfish sanitation research facilities was discussed at the last Workshop. It is gratifying to report that this need has been partially fulfilled by the construction of two new Research Centers. One is the Gulf Coast Shellfish Sanitation Research Center located at Dauphin Island, Alabama, and the other is the Northeast Shellfish Sanitation Research Center located at Narragansett, Rhode Island. The Gulf Coast Center serves the Gulf and South Atlantic States from Texas to South Carolina and the Northeast Center serves the States from North Carolina to Maine.

PHS research programs on the West Coast are centered at the Purdy, Washington laboratory, a facility owned and supported by the State of Washington. Plans are being made for eventual replacement of this temporary structure with a permanent facility containing resources and services paralleling those offered by the Gulf Coast Center. A presentation describing the activities of the Centers will be presented in greater detail later on in the Workshop.

Chemicals in Coastal Waters

The increasing use of pesticides has produced serious technical problems in sanitary shellfish control, but happily has not caused significant public health or public relations problems. While the presence and distribution of pesticides has become ubiquitous in our lives, perhaps the use of these elements in the science of agriculture or pest control activities touches shellfish sanitation the closest. Pesticides dissolved or suspended in surface run-off from large drainage basins are mixed, transported and concentrated in the shellfish growing waters of estuarine areas. As a result, pollution by pesticides has become a very important factor in sanitary shellfish control. As shellfish have the demonstrated ability for rapid uptake, but slow release, of pesticides, their presence in shellfish tissue has serious public health considerations.

This year, some shellfish beds in an Eastern State had to be closed due to accidental "contamination" with BHC used in mosquito control activities. While the area affected had been previously closed for bacteriological reasons, the shellfish were nevertheless suitable for transplanting and eventual marketing. This event curtailed the transplanting activities with attendant hardship to the transplanting firms and loss of tax revenue to the State conservation agency. The question naturally comes up, how much of what insecticide is too much? Precise standards or tolerance limits have not yet been established for shellfish or shellfish growing waters, but it is hoped that this can be done in the near future. The lack of such standards should not discourage control authorities from maintaining surveillance programs and liaison with agencies engaged in insecticide activities to assure that shellfish sanitation interests are represented.

Radioactive Elements

The influences of radioactive elements upon shellfish growing areas is a matter of continuing concern to control officials. Since shellfish also have the ability to accumulate and assimilate radionuclides, the necessity for maintaining close control over radioactive elements becomes an additional factor in sanitary shellfish control.

Research in the use of nuclear fuels is constantly making technological breakthroughs by pushing back the economic barriers associated with the use of this energy source. In 1962, the Pacific Gas and Electric Company completed construction of a power reactor adjacent to Humboldt Bay in California. As Humboldt Bay is the major shellfish production area in California, it was essential that State control officials be aware of water conditions prior and subsequent to the operation of the unit in order to determine its influence on the shellfish growing waters. A reactor is also planned for construction on Oyster Creek in New Jersey. The location of this reactor correctly implies the interest of the Program as it is a shellfish producing area.

The location of nuclear reactors on estuaries, or contributory watersheds thereto affecting shellfish populations, makes it essential that necessary monitoring be performed to insure the safety of the product. In addition, suitable communications should be established between shellfish control agencies and reactor management in order to reflect any necessary reclassification of any affected growing area in the event of operational malfunction.

The use of nuclear fuels by naval vessels (and presumably by merchant shipping in the future) must also be considered. Occasionally, these vessels need replacement of the fuel elements and servicing of the power reactor apparatus. Although such operations are carefully handled, the operating procedures contain provisions for response to the possibility of accidental spills or mishaps. Where such servicing takes place approximate to estuaries, it is essential that control authorities be aware of such events and be prepared to execute necessary control action in the event of a mishap or accident which would influence the quality of shellfish areas.

While radioactive influences are a relatively recent factor in sanitary shellfish control, it should be recognized that problems associated with the application and growth of nuclear technology will increase in magnitude. The application of this technology will require that shellfish control programs be responsive to its use and cognizant of its influence upon sanitary shellfish production.

Newsletter

At the last Workshop, it was suggested that consideration would be given to the establishment of a Public Health Service Shellfish Sanitation Newsletter. We are pleased to report that the Shellfish Sanitation Branch Quarterly Newsletter was initiated in May of 1963 and five issues have been published and distributed since that time. The purpose of the Newsletter is to provide for an exchange of information of technical and general interest to all persons interested in shellfish sanitation.

The Newsletter has been favorably received during the short period it has been in existence and it appears to be an effective device for exchanging shellfish sanitation information. However, we are by no means satisfied with this specialty publication. We need items of technical and personal interest from the States and the industry. There is need for improvement, on our part, in technical reporting in abstract form in order to provide maximum information in minimum space. We are hopeful that significant improvement will be made in the quality of the Newsletter during the next two years.

Training

Training needs in shellfish sanitation have been reevaluated and substantial changes have been incorporated into this essential activity. In the past, shellfish training has been of a general nature, and was not responsive to specific needs. The training program has been reoriented to offer courses in specific areas of shellfish sanitation, generally corresponding to specific program elements, such as Sanitary Survey Procedures, Plant Sanitation, Growing Area Patrol, and others. For example, a course in Growing Area Patrol was held for patrol officials in August of 1964. This course was the first of its kind and was designed to meet the specific training needs of the related program element. While some of the courses mentioned have not been presented as yet, they are being prepared for the coming year. The courses will be brought into the field, to the States, and where possible, will be tailored to fit conditions peculiar to the area. It is hoped that this reorientation in training activities philosophy will help the States in training new employees in shellfish sanitation and by providing their professional staff with current information and techniques in sanitary shellfish control. We are hopeful that the shellfish industry will assume an active role in the proposed training activities to provide the balance necessary to reflect the views and experience of this third partner of the Cooperative Program.

Congressional Hearings on Problems of the Shellfish Industry

In October of 1963, hearings on the subject "Molluscan Shellfish" were held before the subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries, of the House of Representatives. Representatives of the shellfish industry, State health and conservation agencies, the Fish and Wildlife Service, the Public Health Service, and other interested groups appeared before the subcommittee to testify on current problems facing the shellfish industry. Testimony was presented regarding current problems in shellfish culture and water pollution and their interrelationships. Of particular interest to this group was the testimony presented by the Conference of State Sanitary Engineers. The CSSE recommended in favor of the need for National shellfish legislation to provide a legal basis for the present certification program. Such legislation would probably be designed to prohibit the movement of non-certified shellfish in interstate commerce, establish a matching grant program for State shellfish control agencies, prohibit importation of fresh or frozen shellfish into the United States without a permit by the Surgeon General of the Public Health Service, and charge the Public Health Service with continued research and training efforts. Many of you will recall that the last Workshop recommended Federal action to clarify the situation with respect to shellfish imports.

Those of you who have not read the hearing proceedings are urged to do so, as it is an excellent review of some of the most pressing problems in shellfish production today.

Pollution Abatement Interests to Shellfish Control

Some of the problems in shellfish sanitation have been due to the rather negative philosophy of the Cooperative Program toward pollution abatement measures to the Program's attitude toward reactivation of closed areas, and to inadequate communication between shellfish program and pollution control interests. Subsequent to the Congressional hearings on shellfish problems, the Division of Environmental Engineering and Food Protection forwarded a report to the House Subcommittee on Fisheries and Wildlife Conservation describing current problems in, and proposed corrective action for, the Program. One of the courses of proposed action directed toward strengthening the Program was to improve coordination of shellfish sanitation objectives with pollution prevention and abatement activities. Essentially, the proposal describes the need for the recognition of shellfish culture as a legitimate water use; that water quality objectives in pollution abatement programs be recognized and correctly interpreted as they relate to shellfish sanitation; and to provide for information feed-back to pollution abatement agencies at Federal and State levels of adverse pollution effects upon shellfish growing areas.

Such actions would reorient the program toward a positive approach toward resolving problems in estuarine pollution and translate shellfish sanitation interests into pollution program activities. Efforts have been made toward implementation of these elements through conferences with interested groups and by technical assistance from the Public Health Service in estuarine studies.

This concludes the report on the Program Status Report of the Public Health Service. While substantial progress has been made toward assuring national sanitary shellfish production, many problems remain to be resolved. Many of these problems will be discussed during the remainder of this Workshop and we are hopeful that satisfactory solutions can be developed.

Table I.

State* Program Ratings in Order of Rank, Including Program Component Ratings

Gen. Admin. Proc.	Lab. Proc.	San. Surv.	Relaying	Purification	Patrol	Harvesting	Shucking Packing	Final
100.0	N.E.	N.A.	N.A.	N.A.	N.A.	N.A.	100.0	100.0
100.0	N.E.	N.A.	N.A.	N.A.	N.A.	100.0	97.7	99.0
92.8	94.7	N.E.	N.E.	N.A.	95.0	87.5	92.5	93.6
91.0	95.3	90.0	90.0	N.A.	99.0	87.5	94.7	93.4
94.0	95.7	N.E.	N.E.	N.A.	94.2	N.E.	N.E.	92.0
83.5	N.E.	85.3	N.A.	N.A.	96.0	85.0	97.6	89.8
87.0	96.6	76.0	100.0	N.A.	100.0	92.4	96.0	89.7
98.1	95.0	85.7	100.0	N.A.	N.E.	74.8	86.6	88.3
94.0	94.0	74.9	100.0	N.A.	95.0	81.3	92.7	87.5
77.0	97.0	73.2	100.0	N.A.	100.0	87.5	92.9	87.3
89.1	85.0	84.2	N.A.	N.A.	82.0	92.5	92.7	84.9
97.0	98.0	69.5	N.A.	N.A.	90.0	82.0	96.8	84.8**
98.0	97.0	62.0	84.6	97.7	88.0	95.0	91.7	82.9
87.2	80.0	88.2	38.4	N.A.	77.5	100.0	92.4	82.0
92.5	100.0	71.5	N.A.	N.A.	N.E.	91.0	90.9	81.4
94.5	81.7	68.3	N.E.	N.E.	67.2	N.E.	93.1	73.5
93.5	98.0	61.7	N.A.	N.A.	N.E.	59.0	85.6	72.9
66.0	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	84.6	72.2
89.8	86.7	67.3	98.3	N.A.	61.9	70.0	86.6	72.0
86.4	92.5	45.6	N.A.	N.A.	N.E.	40.0	83.3	60.2
93.0	98.0	16.9	65.3	N.A.	70.3	99.0	93.9	59.1
83.1	85.0	46.8	17.6	N.A.	N.E.	69.5	72.4	57.5
60.0	89.4	35.4	N.A.	N.A.	59.0	N.E.	94.4	54.4

*Evaluations were conducted on all coastal States in the United States, except Alaska and Hawaii. Evaluations were also performed on the interior States of Kentucky and Pennsylvania.

**Median

N.E. - Not Evaluated

N.A. - Not Applicable

Table 2. Program Component Ratings by Range and Median Values

Program Component	Range		Median
	High	Low	Value
General Administrative Procedures	100.0	60	92.5
Laboratory Procedures	100.0	80	95.0
Sanitary Survey	90.0	16.9	70.5
Relaying	100.0	17.6	94.2
Purification	97.7	97.7	97.7
Patrol	100.0	59.0	90.0
Harvesting	100.0	40.0	87.5
Shucking-Packing	100.0	72.4	92.7

Table 3. Observed Compliance of Program Element Compliance with 70% Rule

Program Component	No. of Program Components applicable, rated, and complying with 70% rule			
	Components Applicable	Components Rated	Rated components meeting 70% rule	
			No.	%
General Administrative Procedures	23	23	23	100.0
Laboratory Procedures	23	19	19	100.0
Sanitary Survey	20	18	9	50.0
Relaying	20	10	7	70.0
Purification	1	1	1	100.0
Patrol	20	15	12	80.0
Harvesting	21	18	15	83.3
Shucking-Packing	23	22	22	100.0

APPENDIX D

DEPURATION--THE NATIONAL POSTURE

By

Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

The National Shellfish Sanitation Program, and therefore the shellfish industry is rapidly approaching--and may already have reached--a technological crossroad. I refer, of course, to the growing problem of maintaining a satisfactory confidence factor in our National Program. We are particularly concerned with the sanitary quality of waters from which shellfish are harvested for food use.

When the National Shellfish Sanitation Program was established in 1925 the problems of maintaining effective sanitary control of growing areas were relatively simple. Cities were smaller, there was little recreational use of the coast--in fact much of it was inaccessible--and the problems of variable water quality associated with waste treatment was limited to a few small areas. Consequently, only a small percentage of the coastline was polluted or subject to pollution. Under these conditions it was technically and politically feasible to make sanitary evaluations of estuarine areas and to prohibit harvesting from those few areas which were not of satisfactory quality. Under these conditions a program with a high confidence factor could be maintained without undue difficulties.

In the last 15 years many factors have combined to increase pressures on the sanitary quality of our coastal areas. In turn this has made it increasingly difficult to evaluate the sanitary quality of the estuaries, and to assure that shellfish would be harvested only from waters of acceptable quality. Population growth, particularly in the coastal counties, increased leisure time with great interest in beach homes and boats; and improved highways which make the coasts more accessible, all have contributed to these problems. Such problems are, of course, not limited to the shellfish program. One has only to look to the community problem of safe water supply and related controversies over recreational use of municipal water reservoirs and their tributary watersheds.

To keep our discussion in perspective we need to restate the fundamental elements of our program:

1. We are committed to the principle that shellfish must be as safe to eat as other ordinary foods. This is not a total guarantee against illness, but it does carry with it the implication that disease transmission would occur only at infrequent intervals. However, we cannot lose sight of the fact that people must eat to live, and we recognize that shellfish contributes both variety and food value to the diet.

2. Shellfish is not an essential food item and consumers will not purchase shellfish if there is a substantial hazard. This is in contrast to their continued use of automobiles, cigarettes, etc.

3. The problems of assuring the sanitary quality of coastal areas will increase rather than diminish. This is not the same as saying that pollution will increase. There is every reason to believe that public interest in pollution prevention and abatement will continue, and that progress will be made in waste treatment. But, we must realize that this gain may complicate, rather than simplify, the technical and administrative problems which we encounter in trying to meet our consumer-protection oriented goals in shellfish sanitation.

What choices do we have as program administrators at this technological juncture? Insofar as preventing the transmission of disease through shellfish, we must first make a basic choice on use of shellfish:

1. We will maintain a program which will permit consumers to eat shellfish in any form they choose--raw, partially cooked or completely cooked. Such a program must be consistently effective both to protect the public health and to retain consumer confidence.

2. Discourage or limit the consumption of shellfish in at least some forms and to terminate official agency quality control program. For example, public use of raw shellfish might be discouraged just as we discourage the use of raw milk. We might even go so far as to require that all shellfish shipped in interstate commerce be subjected to a normal canning process. Or we might take a middle ground and tell consumers that we will do the best job we can, but that a small percentage of those who eat raw shellfish should expect to become seriously ill. These last two "proposals" ignore the concepts of "sterilized filth" and the interstate requirements of the Federal Food, Drug, and Cosmetic Act.

If we take the first choice, we must then go on to explore the problems of maintaining a consistently effective program. Can we continue to build on the present program of sanitary surveys for growing areas and patrol of closed areas or must we adopt a more sophisticated approach? Our discussions in recent months with representatives of industry and the State control agencies indicate that all have a strong preference for the first choice. They also recognize that this choice carries with it the responsibility for a control program with a high confidence factor. Assuming that this is the consensus we must then examine our present program and problems and decide if they will do the job!

Again we must make a choice between several approaches:

1. To maintain our present program based on surveillance of the sanitary quality of areas. This would also require an aggressive program in support of pollution prevention and pollution abatement programs including the necessary technical efforts at State and Federal levels to assure that these programs will be effective in terms of shellfish culture objectives.

2. To continue our present program based on sanitary evaluation of growing areas, but with the additional safety factor of depuration. Such a program would be effective on a long term basis only if accompanied by aggressive support for pollution prevention and abatement.

3. To establish shellfish reserves in areas which are not influenced by waste disposal practices of communities, and which are denied to all recreational uses or water traffic. This would not entirely answer the problem of salmonella from wild birds or other pollution problems which might go with wildlife.

4. To place all shellfish production on a farming basis in which environmental conditions can be controlled. This might be an open farming system, as now used by the Japanese in Hiroshima Prefecture, or a closed system such as discussed by Mr. McKernan, Director, Bureau of Commercial Fisheries, at the Oyster Institute meeting two years ago.

5. Combinations of one through four above.

We must clearly understand that we cannot talk about the United States as a single unit, having identical problems. We recognize that population growth and use of the estuaries varies greatly from area to area. We also recognize that sanitation problems are species related--e.g., the surf clam is not common in the half-shell trade. In some areas and with some species of shellfish there is an urgent need for action to assure continuing satisfactory program confidence factor. However, with other species or in other areas this need may be several years away. Inevitably, this introduces an element of inequality which cannot be avoided. Everyone cannot be treated the same without being unfair to some percentage. But, we always come back to the factors of public safety, public confidence and market inter-relationships.

Let us now look briefly at these alternative courses of action:

First, we have the proposal of no change, other than aggressive and coordinated support for pollution prevention and abatement in terms of shellfish objectives. This approach has served us quite well in the past, and it is still a manageable process in most areas. But, as previously explained, we believe that this approach is rapidly becoming obsolete and that we must move rapidly to the development and adoption of new methods if we are to maintain a satisfactory confidence factor.

Second, is the proposal that areas be "reserved" for shellfish culture as they are now set aside for migratory waterfowl, military use, National Parks or recreational areas. This may be practical in a few limited areas but in most places it is already too late because of the present degree of development and public and industry pressure for multiple use of the water areas. It seems probable that these pressures will grow, rather than diminish, and the "reserves" would limit very severely the total number of acres of land available to the shellfish industry, would not solve the related problems of "wild" growth and patrol, and would not solve the problem of salmonella, etc., from waterfowl or wild animals.

Third, we have the proposal that shellfish be grown only under controlled conditions--a system under which water quality problems can be more readily managed. While this concept may seem revolutionary, we need only look at the trout industry to obtain an indication of what can be done. The Japanese culture techniques, as applied in Hiroshima, is a use of the same idea but under open seas conditions and the West Coast oyster industry is another variant. The extent to which such systems might be adopted by industry is difficult to predict. As pointed out by Mr. McKernan in a talk before the oyster industry the concept has great merit, but it would also pose great financial, technical and sociological problems. Of the several systems which we are considering, the proposal for "shellfish farming" to "open seas" conditions will also run head on into the problem of multiple use of the estuaries. I doubt if the shellfish industry will be able to preserve great areas of the coast for its exclusive use.

Finally, we have the process of depuration with a general control of sanitary quality of coastal waters. It is, of course, essential to recognize that depuration is not a substitute for pollution control. Also, our other programs for evaluations of the sanitary quality of shellfish growing areas would have to be continued. The depuration process seems to offer a process whereby most of coastal areas could continue to be used for shellfish culture. It would impose no limits on how shellfish might be consumed. It would require no sweeping changes in the structure of industry. It appears to offer a reasonable level of security to the consumer, it meets the problem of wild growth, it allows multiple use of our estuaries, and it offers a product of superior organoleptic quality, and it might offer substantial savings in the construction and operating costs for sewage treatment plants in many coastal areas.

On the negative side depuration adds to the cost of handling (as compared with a product harvested for direct use), requires official agency supervision, changes in industry marketing practices, and a substantial capital investment. We admittedly do not have all the scientific information we would like to have about the process, particularly in terms of costs and design factors. Generally, however, it is our belief that adoption of the depuration process is the most practical approach to maintaining an acceptable confidence factor in the shellfish program.

We concede that there are areas in which direct harvesting can be permitted for many more years and we also recognize that there are areas in which the establishing of shellfish reserves or controlled production will produce equivalent results. But for great areas of the country we feel that a choice must soon be made between adoption of the depuration process or abandonment of the shellfish industry as it now exists. If this is so, we must then face the questions of when, where, how and who. Where is it first needed, when will it be needed, what types of plants are needed for maximum effectiveness and efficiency, and who will pay for costs of treatment. It is my belief that we must address ourselves to these problems rather than to debate of the relative merits of the process.

Actually the depuration process is not new. As a process, it was investigated extensively by European workers about 40 years ago and is now in wide use in many of the European countries. In fact, much of the European shellfish industry is entirely dependent upon the process. We understand that there is no epidemiological evidence which indicates that the process has not been satisfactory from a public health standpoint even though some of the shellfish are harvested from areas which, by our standards, would be classified quite heavily polluted.

We in Public Health Service have been very interested in learning more of the European experiences. Two years ago a field team was sent to Europe to gather first-hand information on this process and on their administrative experiences. We had anticipated that this report would have been completed and available for your study well in advance of this meeting. The prolonged hospitalization of one of the investigators disrupted this schedule; however, we anticipate it will be completed and available within the next few months. In addition, there has been considerable experience with the process both in the United States and in Canada. Many of you are familiar with the Newburyport plant which has been operated by the Massachusetts State Department of Health for many years. In addition, a commercial plant is now in operation in Maine, and a second commercial plant has been established in Florida. Many of you are also familiar with the investigation of the process made by several of the States and by the Canadian agencies. Much of this experience will be summarized in the following reports from the States and by Mr. C. B. Kelly representing the Public Health Service shellfish research program. I think you will agree that some real progress has been made and that further progress can be expected in the near future.

In my opinion we are quite safe in assuming that both the effectiveness and economics of depuration can be improved through research and development effects. However, I do not think we should let our imperfect knowledge stand as a barrier to early--in some areas immediate--adoption of the process.

In summary, it is our recommendation that the Workshop endorse the following concepts if shellfish are to be used as food:

1. That a satisfactory confidence factor is necessary to protect the health of the consumers and to assure their continued acceptance of the product.

2. That in many areas the problems of assuring continuous high sanitary quality of shellfish areas are such that it is becoming exceedingly difficult to maintain a satisfactory confidence factor in the product.

3. That the National Shellfish Sanitation Program be conducted at programs at a level which will assure satisfactory confidence factors.

4. Encourage continuing research programs into depuration processes and any other techniques which would help to assure the sanitary quality of shellfish.

APPENDIX E

PRESENT STATUS OF DEPURATION IN FLORIDA

By

Larry Gillespie
Florida Board of Conservation
Marine Laboratory
St. Petersburg, Florida

Florida, with approximately 8,000 miles of shoreline, has many acres of actual or potential water bottoms suitable for shellfish culture. Due to price and production fluctuation, it is hard to approximate the economic value of the shellfish yield in Florida, but a rough estimate would place the State-wide industry at 1.5 to 2.0 million dollars annually.

Florida's oyster industry is largely centered at Apalachicola, but other areas of production exist in the State's many estuaries. In the past, most of Florida's leading estuaries supported a thriving shellfish industry. However, many of these areas have been rendered unproductive largely due to sewage pollution and not because of any actual lack of water bottoms suitable for shellfish production.

One of the most important problems of our shellfish industry is to make oystering a reliable source of income year in and year out. Partly because the production areas are so scattered and the miles between areas so great, it is desirable that each area be self-sustaining. In order to have a reliable supply of marketable shellfish in most, if not all of the areas, the pollution problem must be dealt with. An effective control of pollution itself is desirable but not always possible. Depuration or cleansing of shellfish from marginal or polluted waters could be a possible solution to this dilemma.

The Florida Board of Conservation Marine Laboratory has been testing depuration methods for approximately one year. With the cooperation of Bay Seafoods, Inc. of Palmetto, Florida, a series of tests was conducted to check depuration technique and methods. This particular phase has been terminated, but perhaps a brief discussion of that work would be in order.

The physical structure of the plant consisted basically of three parts: the holding tank, the sterilization unit, and the circulating system.

The holding tank was constructed of 3/4-inch marine plywood coated with epoxy resin. The dimensions were 16 ft. long x 8 ft. wide x 4 ft. deep. It had a maximum capacity of about 3,800 gallons, but the experimental volumes used ranged from 1,500 to 2,000 gallons.

The sterilizing unit measured 30 inches wide x 9 ft. long and housed six 30-watt germicidal lamps. The height of the lamps was varied during the test. The bottom of the sterilizer was constructed of corrugated plastic to give greater irregularity to the water and afford better killing power.

The circulating system contained a 1/2-HP electric pump, one 1/2-inch PVC plumbing and a diatomaceous earth filter of the swimming pool type. The water was drawn directly from the bay and adjusted for salinity with fresh well water. Aeration was accomplished by the use of baffles between the sterilizing unit and the holding tank.

Coliform counts of the water and also the meats were used to evaluate the system. Checks were made using two different species--the American Oyster (Crassostrea virginica) and the Rangia Clam (Rangia cuneata). Up to 40 bushels of clams were used in these tests.

Our results on this series of tests were erratic and inconsistent. However, much information and perhaps insight was gained on the technique and methods required in this process of self-purification of shellfish.

During the course of the study many problems became apparent. The major ones, as they appeared to us, were to maintain proper circulation and rate of water flow; and to remove feces, waste products, and scum from the tank (this was particularly true in the case of the Rangia Clam). Many other problems or factors such as lowering the ultraviolet tube closer to the water, using approved reflectors, sterilizing the water and sanitizing the system before the shellfish are added, and temperature control were encountered in this study. Incorrect or insufficient cleaning of the shellfish before the sterilization process is started also appears to be a major source of trouble.

With these problems in mind we are in the middle of another series of tests designed to determine the most applicable method of depuration for our area. Of course, all of the known influencing factors must be considered and an attempt to equate experimental methods in terms of commercial practicalities must be made.

We are now using a small experimental pilot system. This unit is composed of a holding tank, a circulating pump and plumbing, a filter, a sterilizing unit and aeration baffles. In general, most of the component parts are made of epoxy-covered plywood and PVC plumbing fixtures.

The holding tank measures 3 ft. long x 5 ft.wide x 1 ft. deep. Good circulation was accomplished in this tank by dividing it with weirs into four compartments. Water flows into the first compartment of the tank from the aeration baffle. It flows over the first weir, under the second and over the last one. The shellfish are kept in racks one inch from the bottom of the tank in the middle two compartments. The experimental water level is maintained at 200 liters. From the last compartment the water is pumped into a small glass wool filter and is then allowed to flow by gravity into the sterilizing unit. This unit measures 10 inches wide x 24 inches long x 8 inches deep and houses three 15-watt germicidal lamps. The height of the ultraviolet lamps from the water is six inches. From the sterilizer the water flows over the aeration baffles back into the holding tank.

The following variable influencing factors are being checked or will be checked: the oyster-water volume ratio, the circulation factor or rate of flow in reference to the total amount of water, the amount or removal of feces from the water, and the ultraviolet light intensity. Other influencing factors that must be given consideration are the general health of the shellfish, the original cleaning of the animals, and the sanitizing of the tanks and equipment.

At this time, we have completed two tests using one and two oysters per liter of water (200 to 400 average 3-inch size oysters per test). A maximum pumping rate of about 900 l/hr was maintained in each test. This would give a circulation turnover of about 4.5 times per hour. The detention time of the water in the sterilizer ranged from 15 to 25 seconds. Bacterial tests were made on both the meats and the water every 4 hours for 24 hours and also at 36 and 48 hours.

On the basis of the coliform test data, the water from the first test was coliform free after 4 hours and the oyster meats were below 800 MPN per 100 after 12 hours. In the second test the water was pure, zero count, in 4 hours and the meats were down to 1,300 in 4 hours. With one exception at 16 hours which we attributed to a laboratory accident, the meat counts were well below this figure throughout the rest of the 48 hours. The original coliform count of the meats at the start of each test were 9,500 and 240,000 MPN per 100 ml.

Our future plans call for a continuation of these tests using the small pilot set up, systematically checking the various influencing factors, and modifying the unit to adjust for these findings. Also utilizing all available information, we plan to build a commercial size unit and continue our work.

Employing the 50 percentile (cf. 2 above) which shows that a 30% reduction may be obtained under the conditions of operation as presently employed, the raw shellfish should not exceed a median MPN of 8000. This is far short of the 24,000 MPN limit established for shellfish to be used in a depuration system. Apparently, if we are to continue the shellfish depuration program, additional research is necessary to determine more efficient methods of depuration. The deficiencies of the depuration system may not lie in the mechanical features themselves, but in the shellfish. Certainly, biologists appreciate the fact that we are not dealing with such artifically programmed procedures as the chlorination of water, the pasteurization of milk, which practices can be easily standardized since the products to be rendered safe are inanimate, but with living matter exhibiting a multitude of inherent, varied characteristics which may behave one way today, another way tomorrow, and yet another way the next day. Investigations into the biology and physiology of shellfish and their relationships to coliform, pathogens and viruses are necessary before predictions relative to their reactions and interactions are possible. This kind of research is usually beyond the facilities provided to the States for implementation of their shellfish programs and probably should be undertaken by the Federal Government in their newly established shellfish research centers. We have looked to the Public Health Service before for basic research in many fields, and they have always rallied to our call. Hopefully, in this area of shellfish sanitation, on which so many are dependent for their livelihood, the call will not echo in the halls of well equipped and well staffed laboratories too long before it is heeded, and "the charge is on."

APPENDIX F

DEPURATION IN MAINE

By

Phillip L. Goggins
Maine Department of Sea and Shore Fisheries
Boothbay Harbor, Maine

Untreated sewage discharged in Maine coastal waters contaminates our shellfish growing areas, rendering these shellfish unfit for human consumption.

Between 1946 and 1960 the acreage of these areas which had to be restricted because of sewage pollution increased 15.6%. In 1960, 46,958 acres were closed because they were polluted. Further closures have been catastrophic to some of our coastal communities. Improved standards of living, additional summer cottages, increased tourist populations, all multiply the sewage draining toward the sea, causing this condition.

Pollution abatement programs, recently accelerated in Maine, cannot, by themselves, provide conditions allowing the unrestricted taking of shellfish. But these programs tied in with a controlled shellfish depuration scheme would permit the use of a major part of currently restricted areas.

Maine towns have had shellfishing rights since colonial times. Now, to keep these rights, the towns have to agree to manage their shellfisheries under a State-cooperative management plan. Most towns already are regulating their shellfisheries thus. It is apparent that shellfish depuration will soon be essential to shellfisheries management. In Maine our principal concern is the soft-shell clam (Mya arenaria.)

Early in 1964 the Maine Department of Sea and Shore Fisheries accelerated its research when it accepted a contract with the Area Redevelopment Administration to develop, in York County, a method for clam cleansing.

Following is a resume of work accomplished under the ARA contract and under a current contract with the U. S. Public Health Service. The full ARA report is currently being revised for publication:

DEPURATION STUDIES

The objectives are: 1) Determine the effect of environmental factors on depuration. Some of these are temperature, salinity, oxygen, and ratio of water flow to shellfish. 2) Develop equipment to handle shellfish through a depuration plant, 3) test the efficiency of handling and purifying shellfish on a commercial scale, and 4) develop and test a public health control scheme from the harvest grounds through the depuration. A dependable supply of inexpensive clean seawater is essential. Natural sites cannot be relied upon to produce clean water because our coastal water has multiple uses. It is necessary to treat the water.

Water Treatment

It was first necessary to treat the water in the clam cleansing operation. We considered the chlorination method but, because of its disadvantages, decided upon the ultraviolet sterilizer as developed by Kelly (1961). A treatment unit with fourteen 30-watt ultraviolet lamps similar to that of Kelly was built. The germicidal efficiency was about the same as his, 99.9% coliform reduction at approximately 35 gallons per minute. Sand filtration experiments through well points inserted at low tide level were made in York County, in southern Maine, and evaluated because of the importance of turbidity in ultraviolet sterilization, and because of the availability of sand beaches in the study area. At 30 gallons per minute, with the well points covered with 18 inches of sand, coliform bacteria were reduced 92%. Raw water averages from 758 MPN coliform to 61 MPN.

Environmental Factors in Depuration

The experiments in the laboratory with soft-shell clams were designed to obtain information about the effect of operational procedures, and environmental stress on depuration. Load rates, hosing during the cleansing cycle, the effect of low salinity, depth of shellfish in containers during cleansing, and comparison between closed and open systems are some of the factors we considered important.

The water system we used was a flow-through one. Therefore it was necessary to determine a safe ratio of water flow to shellfish. For laboratory depuration tanks, plastic waste baskets of nine-liter capacity were used. These tanks were mounted so the intakes were centered in the bottom. Plastic-coated wire racks were placed two inches above the bottom to allow circulation space under the shellfish. The outlet was located centrally two inches from the lip of the basket. The baskets were fed from the sterilizer through a manifold with petcocks, to adjustable evaluations - standpipe reservoirs made from pint plastic freezer containers. With these adjustable head devices, we were able to control flow to between fifty and 2000 ml. per minute, ± 10%. Twelve of these baskets with head controls were used in most of our experiments. Several water displacement measurements showed the average bushel of soft-shell clams, used in our experiment, to be 19.6 liters. One-half peck of clams, with an average volume of 3.2 liters, was used as a standard test volume for the laboratory depuration tanks. Flow rate was calculated as follows:

$$\frac{\text{Vol. of bushel clams in cc}}{\text{Vol. of clams in test tank in cc}} \times \frac{\text{Flow rate in cc}}{1000} = \text{Flow rate in l/bu/min}$$

(See Tables 1 and 2.)

Our results indicate that between 16° and 20° C., at flow rates less than 1.5 l/bu/min, purification was adversely affected with oxygen depletion ranging between 70% and 90%. At 1.6 - 3.0 flow rate purification was not adversely affected, and oxygen depletion ranged between 35% and 70%. We feel that a flow rate of one gal/bu/min is a safe one.

Washing the exterior of the clams by flushing with a high pressure water spray was then evaluated. Seventeen lots of clams were a zero hour median of 16,000 coliform and 3500 presumptive fecal coli were run through the laboratory cleansing plant at controlled flow rates of one gal/bu/min, with varying temperatures ranging from 15° C. - 20° C. The clams were flushed after twelve hours. After twenty-four hours the average bacterial reduction for the washed clams was 81% coliform and 98% fecal coli. The clams which were not washed reduced 88% coliform and 91% fecal coli after twenty-four hours, and 96% fecal coli after 48 hours.

These results do not indicate any benefit from washing after twenty-four hours, but do after forty-eight hours.

Singled Layered Clams vs. Layered in Depth Clams

Clams in single layers were compared with clams at various depths in the laboratory cleansing tanks. No adverse effect on depuration could be demonstrated in relation to depth. Our results showed that clams in a single layer did not cleanse quite as well as composite samples from bottom, middle, and surface layers of the laboratory cleansing tanks.

Open vs. Closed System

The open system sterilizer for the following comparison was trough-type, four ultraviolet lamps being used. The lamps were 30-watt. The sterilizer's germicidal efficiency tested comparably with Kelly's unit. The closed system used the Kelly unit. Water was recirculated through the unit from a reservoir of 360 gallons of seawater at the rate of six gallons per minute.

Standard laboratory cleansing tanks were used and water flow was adjusted at approximately one gal/min/bu. Temperature in the open system varied between 11° and 11.5° C. In the closed system it remained at room temperature of 18° C.

The rates of depuration in both systems were nearly the same for the 24-hour period, with 90% coliform and *E. coli* reduction. However, during the second 24-hour period, a tenfold increase in coliform MPN showed in 43% of the runs, while the *E. coli* MPN remained the same or increased only slighly. No such increase was observed in the open system clams.

Perhaps one explanation of the increase in the closed system during the second 24-hour period might be made by postulating that the high temperature accelerated the breakdown of the mucus of the feces, thus releasing either previously immobilized bacteria, or bacterial growth in the slime formation on the tanks, thereby permitting bacteria to be reconstituted and to cause repollution.

Laboratory vs. Commercial Pilot Plant Depuration

Parallel runs compared depuration using heated water from the pilot plant at Biddeford Pool, and "as is" temperature water at the laboratory in Boothbay Harbor (fig. 1).

Half-peck samples of identical lots of clams from the pilot plant were transported to Boothbay Harbor and run through the laboratory depuration plant. Water at the pilot plant was heated approximately 10° C., water at Boothbay Harbor was unheated.

The results shown in Table 3 do not indicate any dramatic benefit from heating the water. Because of the unquestionable increase in activity of the clams in the heated water as observed visually - extension of the siphon and increase in cilia action - we cannot support a more precise statement concerning depuration at various temperatures.

Experimental Commercial Depuration

Table 4 shows the results of Sea and Shore Fisheries commercial plant at Biddeford Pool, and of the recently established private experimental commercial operation owned by Sea Fair, Incorporated, at Sebasco Estates. Two observations pertinent to standards for depurated clams should be made on the basis of the results: 1) Levels much lower than the interim oyster standard of 78 - 230 MPN can be attained, especially for the 48-hour cycle, and 2) the initial load is very important. The initial *E. coli* MPN of one of the Biddeford runs was extremely high, 11,000. This run did not cleanse to a satisfactory level in 48 hours. The Sea Fair results, on the other hand, show that the highest initial MPN of 2400 *E. coli* cleansed to 490 MPN in 24 hours, and to 20 MPN *E. coli* in 48 hours. The 2400 MPN *E. coli* initial load did not reduce to the oyster standard in 24 hours. We feel that safe initial levels for 24-hour cleansing cycles and for 48-hour cleansing cycles should be determined. When we accumulate more data we can be more precise in stating levels. However, we have observed this same result previously using coliforms. An extremely high coliform MPN initial load would reduce to a relatively high level in 24 hours, and remain at essentially the same point indefinitely.

PILOT COMMERCIAL DEPURATION PLANT FOR SOFT-SHELL CLAMS

A pilot commercial depuration plant for soft-shell clams was established at Biddeford Pool to develop necessary equipment, to test laboratory results on a commercial scale, and to develop and test control plans from the production area through the plant.

Procedure

The production flow through the plant is as follows: The incoming clams are passed through a mechanical washer on a conveyor belt where polluted sediment is washed from the exterior of the clams by pressure spraying, and broken, dead, and injured clams are rejected and removed. The clams are then collected in plastic mesh half-bushel baskets, which are placed in a tank, transported, and lowered into the depuration tank by means of an overhead monorail crane.

A constant flow of sterilized water is maintained in the tank. The water may be pumped through well points if enough sand overslough is available. A heat exchanger may be used to keep water temperature at the optimum for feeding of the clams.

At the end of the depuration cycle the clams are taken from the tanks and passed through the mechanical washer for final cleansing and culling. They are then packaged for commercial distribution.

COMPONENTS

Sterilizer

The sterilizer is an ultraviolet Kelly unit. Figure 2 shows construction details. It is built of half-inch plywood. All valves and pipes are polyvinylchloride. The fourteen 30-watt ultraviolet lamps provide a two-plus safety factor.

Clam Washer

Figure 3 shows the sketch of this unit. Clams are loaded in a hopper which is filled with water to prevent breakage. An open mesh conveyor carries the clams through a tunnel where high pressure jets spray the clams with treated water. The conveyor carries the clams over a level culling table where the clams are inspected for broken shells. Then the clams drop into vinyl covered cleansing baskets. If breakage is less than seven percent one inspector can cull one bushel per minute.

Baskets

The baskets are half-bushel, measure 21 in. x 12 in. x 6 in., are constructed of expanded steel, covered with vinly plastic with 3/4 in. mesh. These baskets have already withstood seven months of rough handling (fig. 4).

Tanks

Tanks are built of 3/4 in. reinforced plywood with synthetic resin. They are 4 ft. x 8 ft. x 2 ft., and will hold 28 baskets in two layers. A weir box at the intake and surface outlets opposite allow circulation from bottom to top. Three of these tanks give the pilot operation a 36 - 42 bushel capacity. Twelve or fourteen gallons per minute constant flow permits the gallon per minute per bushel recommended flow rate (fig. 5).

Monorail System

A monorail with hoist and rack which holds twelve half-bushel depuration baskets is used to load and unload in and out of the tanks. The racks are made of quarter angle iron, 3 in. x 3 in. Baskets from the washer conveyor are placed on the rack and transported to the tanks.

Heat Exchanger

A small heat exchanger provides about fifteen gallons per minute of water 10° C. above ambient temperature, and allows us to evaluate the effect of the heating of water on soft-shell clams.

CONCLUSION

The pilot plant at Biddeford Pool was successful in cleansing clams. Sea Fair, a commercial operation, has been operating since August 15, 1964. There has been no difficulty with the sanitary control plan.

CONTROL SYSTEM TO BE USED FOR SHELLFISH PURIFICATION IN MAINE

May 15 - October 15, 1964

I. Production Area Evaluation
    A. Shellfish and Water Quality Factors
        1. Determining whether water falls into 70 - 700 MPN range
        2. Checking history of bacterial level of shellfish for cleansing cycle prediction
        3. Determining seasonal water salinity range
        4. Determining seasonal shellfish liquor salinity range
        5. Determining general condition factor of shellfish
        6. Passing trial runs through purification plant of clams, before deciding cleansing cycle
    B. Other Factors
        1. Estimating production
        2. Checking availability of diggers

II. Controlling Harvest from Production Area to Purification Plant
    A. By Local Control Officer
        1. Will supervise digging, enforcing pertinent public health laws
        2. Will tally production and tag
        3. Will place shellfish in closed truck
        4. Will seal truck with State of Maine seal
        5. Will record time of truck departure
    B. By State Control, State Shellfish Officer Supervising Local Control Officer

III. Choice of Purification Site
    A. Evaluation of Water Quality Factors
        1. History of water quality - must meet 70 - 700 MPN range
        2. Check of seasonal range of salinity
        3. Check of seasonal temperature and turbidity range
    B. Evaluation of Other Factors
        1. Proximity to production grounds
        2. Access to transportation network
        3. Availability of approved fresh water supply

IV. Control of Purification Plant

A. At Local Level, Plant Operator Responsibility

1. For shellfish handling

a. Must break truck seal, wash, and cull shellfish in mechanical washer, in approved fresh water

b. Must condemn broken and injured shellfish

c. Must place in cleansing tanks for proper length of time

d. Must place cleaned clams in clean commercial container, tag, and release

2. For plant maintenance

a. Must check U.V. bulbs daily

b. Must check efficiency of bulbs with germicidal watt-meter periodically

c. Must clean weir box, as necessary

d. Must drain and flush purification tanks with 10 - 20 ppm residual chlorine water after each use

e. Should have recording meter for water flow to tanks

B. At State Level - Officer to Supervise Local Control Officer

V. Laboratory Control

A. Precleansed and Released Clams to be Tested According to Standard Methods U.S.P.H.S. for Coli-aerogenes Group and Gas *E. Coli*.

B. Shell liquor salinities to be run on precleansed and released shellfish

C. Water Testing and Recording

(1) Standard Methods test daily before and after ultraviolet treatment

(2) Daily recording of temperature, salinity, turbidity, dissolved oxygen, and flow rate

Table I. Effect of Flow Rate on Oxygen and Bacterial Reduction at 15° C. - 20° C.

Flow Rate*	Average Percentage Oxygen Removal	Average Percentage Bacterial Reduction			
		24 Hours		48 Hours	
		Colif.	EC	Colif.	EC
.3 - .5	90	68	47	88	82
.6 - 1.	79	73	77	86	94
1.1 - 1.5	70	92	98	96	97
1.6 - 3.0	35	91	92	97.5	97

* Liter/minute/bushel

Table 2. Effect of Flow Rate on Depuration At 15° C. - 20° C.

Rate to .3 - 1. lit./min./bu. MPN/100 gr.						
Percentile	0 hr.		24 hr.		48 hr.	
	Colif.	EC	Colif.	EC	Colif.	EC
10	490	<18	410	<18	230	<18
50	16,000	1400	9200	790	1300	45
90	92,000	5400	16,000	2200	16,000	1300
Range	490- 3,500,000	<18- 5400	410- 92,000	<18- 5400	230- 16,000	<18- 1300
Number of Experiments	15	13	15	13	12	12

Rate to 1. - 7.8 lit./min./bu. MPN/100 gr.						
Percentile	0 hr.		24 hr.		48 hr.	
	Colif.	EC	Colif.	EC	Colif.	EC
10	490	<18	78	<18	210	<18
50	16,000	1400	1300	20	700	20
90	92,000	5400	5400	230	5400	330
Range	490- 3,500,000	<18- 5400	20- 92,000	<18- 490	210- 5400	<18- 370
Number of Experiments	21	16	21	16	11	9

Table 3. Cleansing Results

Pilot Plant with Heated Water, Biddeford Pool
Temperature Range: 9.5° C. - 15° C.

Percentile	0 hr.		24 hr.		48 hr.	
	Colif.	EC	Colif.	EC	Colif.	EC
10	460	78	130	20	170	<18
50	2400	490	490	78	330	<18
90	24,000	3500	5400	2200	1700	230
Number of Experiments	7	7	7	7	5	5

Laboratory Tanks at Boothbay Harbor Station
Temperature Range: 2° C. - 11° C.

Percentile	0 hr.		24 hr.		48 hr.	
	Colif.	EC	Colif.	EC	Colif.	EC
10	460	78	130	<18	230	<18
50	3500	220	490	45	330	45
90	35,000	11,000	54,000	2400	3500	170
Number of Experiments	7	7	7	7	6	6

Table 4. Results of Depuration Operations At Biddeford Pool and Sea Fair

Pilot Plant at Biddeford Pool	0 hr.		24 hr.		48 hr.	
Percentile	Colif.	EC	Colif.	EC	Colif.	EC
10	170	<18	45	<18	<18	<18
50	3500	330	700	78	330	<18
90	16,000	3500	5400	790	1700	330
Range	78- 54,000	<18- 11,000	45- 12,000	<18- 3500	<18- 2400	<18- 330
Number of Experiments	26	26	26	26	20	20

Sea Fair, Incorporated	0 hr.		24 hr.		48 hr.	
Percentile	Colif.	EC	Colif.	EC	Colif.	EC
10	790	40	45	< 18	<18	<18
50	3500	220	330	20	130	<18
90	6400	490	1700	78	490	20
Range	220- 16,000	20- 2400	40- 9200	<18- 490	<18- 620	<18- 20
Number of Experiments	22	21	22	20	<18	19

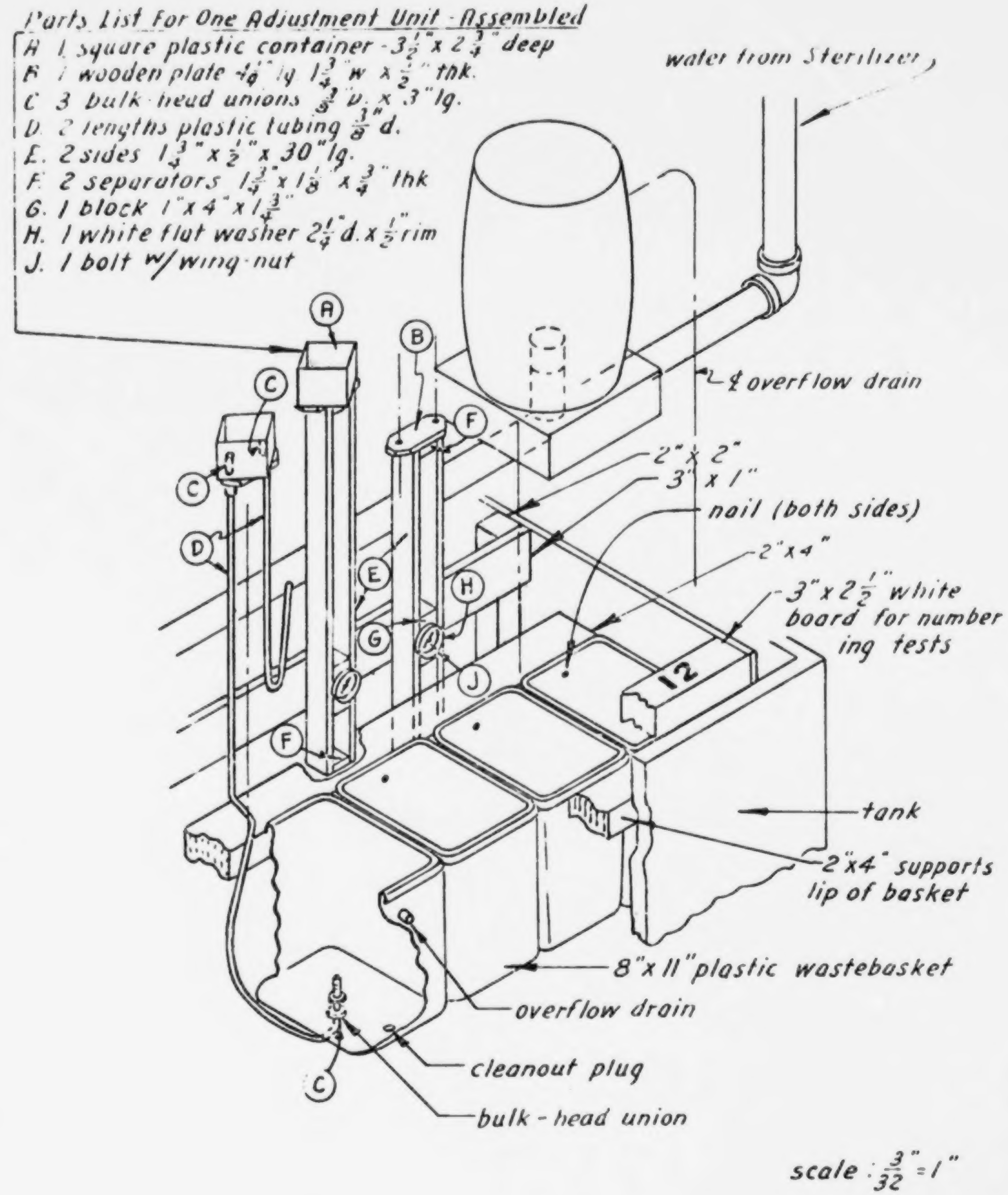

Parts List For One Adjustment Unit - Assembled
A. 1 square plastic container - $3\frac{1}{2}$" x $2\frac{3}{4}$" deep
B. 1 wooden plate $4\frac{1}{4}$" lg. $1\frac{3}{4}$" w x $\frac{1}{2}$" thk.
C. 3 bulk-head unions $\frac{3}{8}$" D. x 3" lg.
D. 2 lengths plastic tubing $\frac{3}{8}$" d.
E. 2 sides $1\frac{3}{4}$" x $\frac{1}{2}$" x 30" lg.
F. 2 separators $1\frac{3}{4}$" x $1\frac{1}{8}$" x $\frac{3}{4}$" thk
G. 1 block 1" x 4" x $1\frac{3}{4}$"
H. 1 white flat washer $2\frac{1}{4}$" d. x $\frac{1}{2}$" rim
J. 1 bolt w/ wing-nut
water from Sterilizer
A
B
C
C
D
E
F
F
G
H
J
℄ overflow drain
2" x 2"
3" x 1"
nail (both sides)
2" x 4"
3" x $2\frac{1}{2}$" white board for numbering tests
12
tank
2" x 4" supports lip of basket
8" x 11" plastic wastebasket
overflow drain
cleanout plug
C
bulk - head union
scale: $\frac{3}{32}$" = 1"

Figure 1. Adjustable Flow Regulator

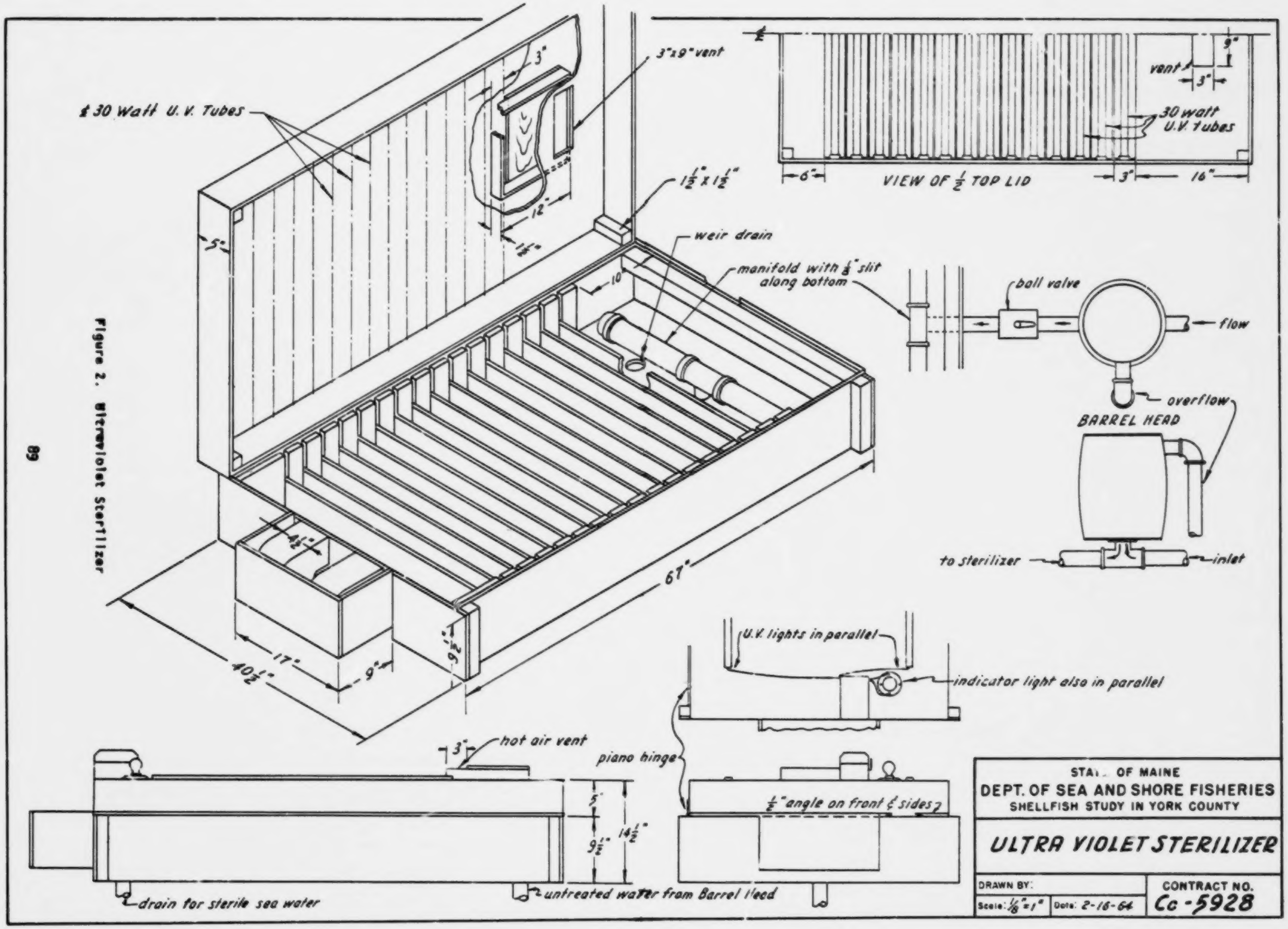

℄ 30 Watt U. V. Tubes
3"x9" vent
3"
12"
1½"
5"
1½" x 1½"
weir drain
manifold with ⅛" slit along bottom
10
4½"
17"
40½"
9"
2½"
67"
VIEW OF ½ TOP LID
vent
9"
3"
30 watt U.V. Tubes
6"
3"
16"
℄
ball valve
flow
overflow
BARREL HEAD
to sterilizer
inlet
U.V. lights in parallel
indicator light also in parallel
piano hinge
½" angle on front & sides
3"
hot air vent
5"
9½"
14½"
drain for sterile sea water
untreated water from Barrel Head
STATE OF MAINE
DEPT. OF SEA AND SHORE FISHERIES
SHELLFISH STUDY IN YORK COUNTY
ULTRA VIOLET STERILIZER
DRAWN BY:
Scale: ⅛"=1"
Date: 2-16-64
CONTRACT NO.
Cc-5928

Figure 2. Ultraviolet Sterilizer

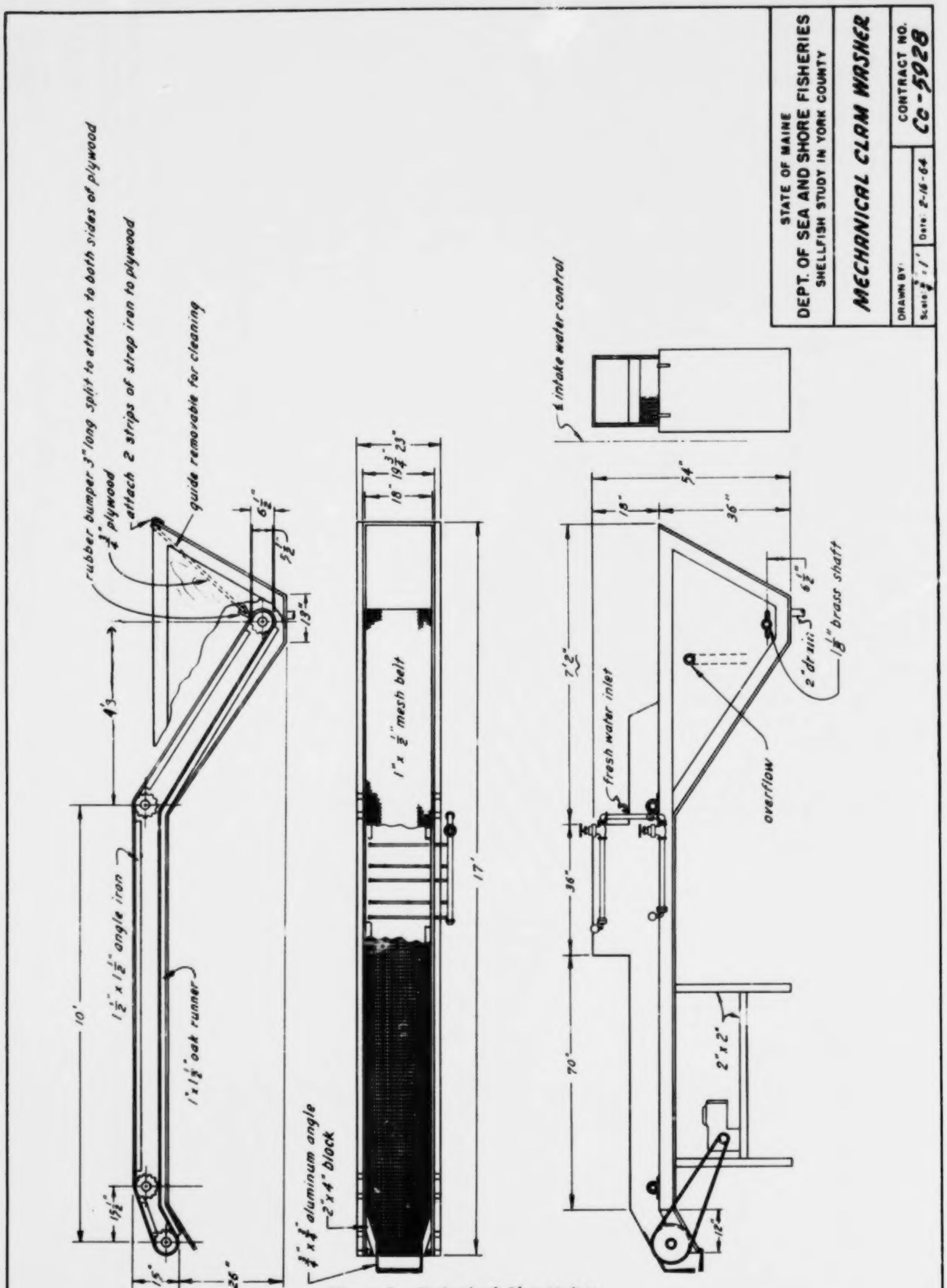

STATE OF MAINE
DEPT. OF SEA AND SHORE FISHERIES
SHELLFISH STUDY IN YORK COUNTY
MECHANICAL CLAM WASHER
DRAWN BY:
Scale ½"=1'
Date: 2-18-64
CONTRACT NO.
Cc-5928
rubber bumper 3" long split to attach to both sides of plywood
¼" plywood
attach 2 strips of strap iron to plywood
guide removable for cleaning
4'3
10'
1½" x 1½" angle iron
1"x1⅜" oak runner
15½"
15"
26"
6½"
5½"
13"
1"x ½" mesh belt
17'
18"
19¾"
23"
¾" x ¾" aluminum angle
2"x4" block
℄ intake water control
54"
18"
36"
7'2"
fresh water inlet
overflow
2" drain
1⅛" brass shaft
6½"
36"
70"
2"x2"
12"

Figure 3. Mechanical Clam Washer

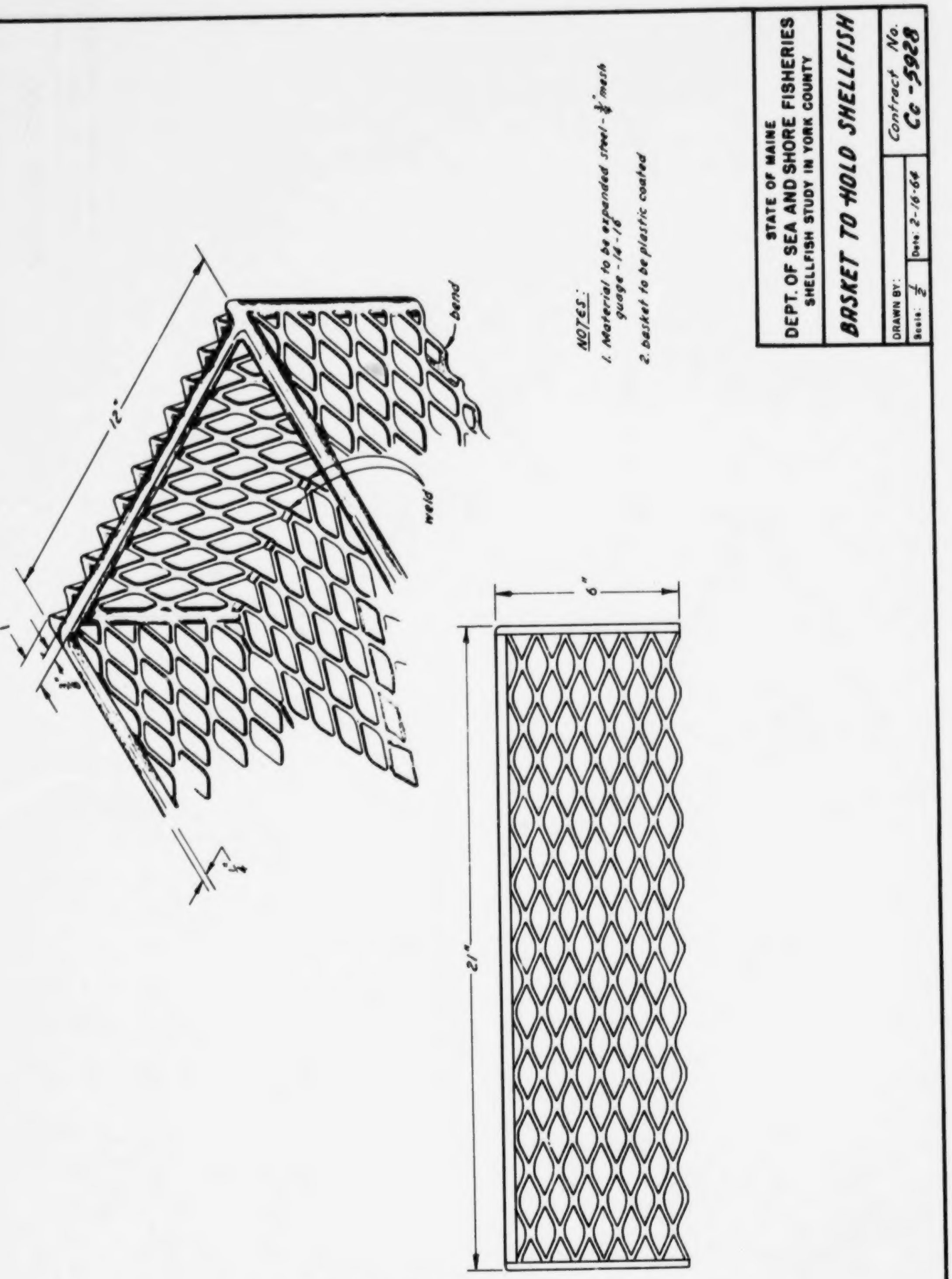

STATE OF MAINE
DEPT. OF SEA AND SHORE FISHERIES
SHELLFISH STUDY IN YORK COUNTY
BASKET TO HOLD SHELLFISH
DRAWN BY:
Scale: 1/2
Date: 2-16-64
Contract No. Cc-5928
NOTES:
1. Material to be expanded steel-1/4" mesh guage-14-18
2. basket to be plastic coated
12"
bend
weld
1"
1/8"
3/4"
6"
21"

Figure 4. Basket to Hold Shellfish

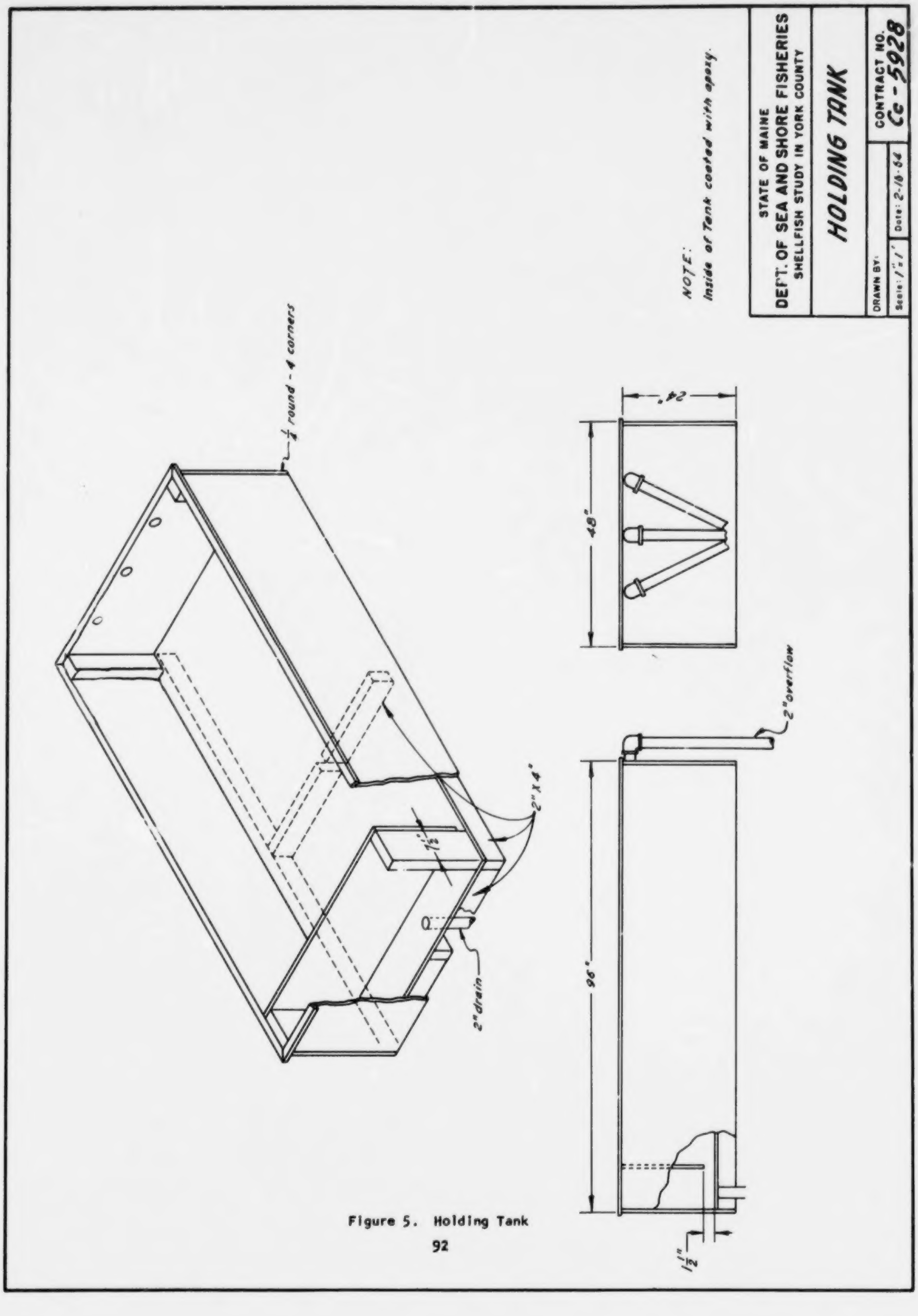

STATE OF MAINE
DEPT. OF SEA AND SHORE FISHERIES
SHELLFISH STUDY IN YORK COUNTY
HOLDING TANK
DRAWN BY:
Scale: 1"=1'
Date: 2-18-64
CONTRACT NO.
Ce-5928
NOTE:
Inside of Tank coated with epoxy.
¼ round - 4 corners
2"x4"
1½"
2"drain
2"overflow
96"
48"
24"
1½"

Figure 5. Holding Tank

APPENDIX G

STATUS OF SHELLFISH DEPURATION IN MASSACHUSETTS

By

Mario M. Boschetti
Massachusetts State Department
of Health
Boston, Massachusetts

Induced self-purification of shellfish, presently known as "depuration," has been practiced in Massachusetts since the early 1930's. The first shellfish treatment plant located in Newburyport is still in operation although the methods originally employed have been modified over the years (1). Shellfish treated at Newburyport are taken from moderately polluted areas in which the waters have a median coliform MPN of 700 or less and the shellfish a median coliform MPN of 24,000 or less. The only species of shellfish treated at Newburyport is the soft shell clam (Mya arenaria). Other depuration plants, which have not been in operation for 20 years or more, were treating quahaugs (Mercenaria mercenaria) for a short time with limited success. The cost of operation coupled with certain difficulties inherent in the process, such as water temperature regulation, forced these plants to close their doors. Prior to 1962, the method of depuration used in Massachusetts was a modification of the Dodgson (2) Mussel Purification Method. A full discussion of this method will not be dealt with here, but such information will be made available upon request. Briefly, chlorine was used as the water sterilizing agent with the concentration kept below 0.5 parts per million. The work of several investigators (3) has since demonstrated that chlorine in amounts approaching zero parts per million can hinder the self-purification process and even when neutralized with sodium thiosulfate. Results over the past 30 years at the Newburyport Shellfish Treatment Plant indicate that effective shellfish depuration, i.e., reduction of coliform content of shellfish to 2400 MPN or less, was not consistently obtained. However, the epidemiological "record" established over these years indicates that the purification process was sufficiently effective to reduce the bacterial and viral content of the soft shell clam below disease causing levels or that the soft shell clam, once cooked, rarely, if ever, has been identified as the responsible agent in the transmission of water-borne diseases. Let me hasten to add that additional possibilities may exist. One that comes to mind is that disease outbreaks due to the consumption of treated shellfish may have occurred undetected or at least not in sufficient numbers to cause public health concern.

Impetus was given to the use of ultraviolet light in sterilizing seawater by research on shellfish depuration performed both overseas (4) and in this country (5). You have already heard of work done in this area today, and I am certain that you will hear more before this Workshop is adjourned. In Massachusetts, the initial research work on the use of ultraviolet light for shellfish depuration was carried out at the Newburyport Shellfish Treatment Plant during 1962 and 1963. This work indicated that ultraviolet light was effective in reducing the coliform content of seawater to virtually zero even when starting with a water containing several thousand coliform per hundred ml. The initial research further indicated that shellfish allowed to feed in ultraviolet treated water showed a marked coliform decrease over that achieved with the use of chlorinated water. Results of the ultraviolet treatment indicated that effective treatment could be obtained 95% of the time while the use of chlorinated water produced only 70% effective treatments.

A large ultraviolet unit was constructed similar in design to the Purdy unit. The Newburyport unit contains 14 G.E. germicidal lamps (G30T8), and has the capacity to sterilize seawater at the rate of approximately 3,000 gallons per hour. Due to the hydraulic characteristics of the depuration system, sterilization of the water in one of the depuration tanks which holds about 3500 gallons of water takes approximately four hours. To facilitate further discussion relative to the treatment process at Newburyport, a rather brief stepwise description of the depuration process follows:

1. Shellfish arrive at the plant in 1/2 bushel boxes of wood and wire construction.

2. If time is available and the shipment is not too large, the shellfish are washed and culled in a mechanical device similar to that used in Maine. Otherwise, the boxes of clams are rinsed in a 50 part per million solution of chlorine and manually culled.

3. The shellfish are loaded into the concrete tanks which hold approximately 250 boxes. They are kept from direct contact with the bottom of the tank and so placed as to allow for circulation of the tank water.

4. The tanks are filled with seawater and chlorine is added at one end of the tank while the tank is aerated for a short time to assure mixing of the chlorine. The chlorine dissipates in 15-30 minutes. Pre-chlorination is necessary since the source of water does not meet the standard of 70 MPN.

5. The tank water is then continuously circulated through the ultraviolet unit at an approximate rate of 3000 gallons per hour.

6. Bacteriological samples are taken of the raw water, the untreated shellfish, the treated water, the treated shellfish, and the tank water before discharged to waste.

7. To indicate whether or not the shellfish receive the full specified 24-hour treatment, a mechanically operated, manually energized recording thermometer is used. One of two leads is submersed in the tank water and the other is positioned directly in the flume of the ultraviolet effluent. In the event of a power failure, which temporarily inactivates the ultraviolet unit interrupting the flow of water, the lead in the ultraviolet effluent will register air temperature and the deviation from the water temperature in the tank will be easily noted. The treatment time lost can be determined and the shellfish will be treated an additional equivalent time.

8. The ultraviolet lamps are checked periodically with a G.E. ultraviolet meter which measures micro-watts per square centimeter of light intensity. The bulbs are cleaned daily and replaced when necessary.

The treatment tanks are constructed of concrete and measure 15' x 5' x 5' in depth. They are divided by wooden baffles into two compartments of unequal size. The smaller compartment, barely 3' in length, serves as the aeration chamber. Air forced in at the bottom of this compartment causes water to rise over the dividing baffle and the resulting currents effect circulation of the water throughout the tank. The larger compartment contains the shellfish. The primary baffle extends from a short distance below the top of the tank walls to a short distance from the bottom of the tanks. A secondary smaller baffle situated near the bottom of the primary baffle prevents the trespass of debris, such as broken shells, pseudo-feces, sand, etc., into the aeration compartment.

During the past ten months, samples of untreated and treated clams have been collected from the Newburyport plant for bacterial examination at the Lawrence Experiment Station. Analyses of the results (see graph 1) which include 70 pairs of samples having an MPN range of 2300 to 92,000 show that:

1. Sixty-five percent show some reduction of the coliform density, 35% show no reduction or an increase in coliform density.

2. Fifty percent of the samples show at least a 30% reduction in coliform density.

3. Twenty-five percent of the samples show at least 64% reduction in coliforms.

REFERENCES

1. Fox, L., Shellfish Sanitation Program of Massachusetts. Sanitalk Vol. 5 No. 6 June 1953.

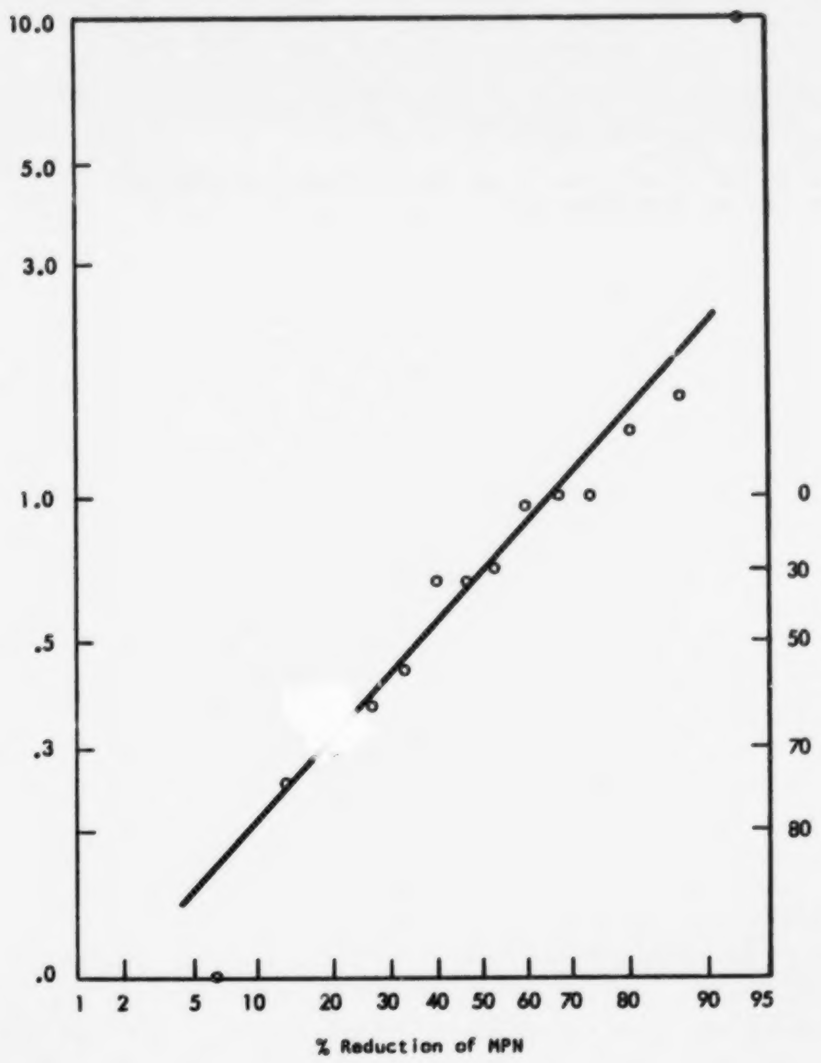
2. Dodgson, R.W., Report on Mussel Purification, Fish Invest., Series II, 10, 1, London.

3. Kelly, C.B.; Arcisz, W.; Presnell, M.W.,; and Harris, E.K., Bacterial Accumulation by the Oyster (Crassostrea virginica) on the Gulf Coast. R. A. Taft SEC, Cincinnati, Ohio, Technical Report F60-4, 1960.

4. Wood, P.C., The Utilization of Ultraviolet Light in the Purification of Oysters. International Council for the Exploration of the Sea. C.M. 1959 Shellfish Committee No. 41.

5. Kelly, C.B., Disinfection of Sea Water by Ultraviolet Radiation, A.J.P.H. Vol. 51, No. 11 November 1961.

Graph I. Ration of MPN of Treated to MPN of Raw Sewage



APPENDIX H

STATUS OF SHELLFISH DEPURATION IN NEW YORK

By

David H. Wallace
New York State Department
of Conservation
Oakdale, New York

The State of New York has two interests in terms of the Shellfish Sanitation Program. New York is one of the biggest consumers of shellfish in the United States, with its big population. We have a very real interest in this product in relationship to the health of the consumer.

Secondly, we have another reason in that we are a producer of shellfish. In fact, we are the largest producer of hard clams. We produce also oysters, mussels and scallops. So we have another interest in terms of the sanitation program dealing with the problems and relationships involving our industry and our control program.

In New York we look upon the Shellfish Sanitation Program as a community project. I am talking about the community in terms of all the people who are involved in it. We feel that we have to maintain a close working relationship with our industry, and it does my heart good to see the turnout of our industry here in this Workshop because they realize the very vital nature of this whole development.

I want to emphasize that we believe we have an obligation and responsibility to our consumers as well as to industry in all of the standard ways that I am sure every other State here is trying to do. As a result of the problems that have been developed and the programs that have been developed, we have been greatly accelerated in our sanitary surveys because we have about 600,000 acres of shellfish ground; 450,000 which is open and 150,000 which is closed because of pollution. We are greatly accelerating our enforcement efforts to police these restricted areas so that the shellfish are not being bootlegged out to the market, and we are trying to do this at every level -- the county level, and the State level.

The third part of our program is one of the things which we believe at the present time is a practical approach to this problem of shellfish in contaminated areas. This is to have relaying of shellfish from contaminated areas to clean waters. As a result of the support of our industry, we were able to launch an aggressive program of relaying in the summer of 1964 which we will greatly expand in the coming years.

The other part of the program is this matter of pollution control and abatement. We have talked about pollution and its ever expansion and I was rather appalled at the conditions that Phill Goggins outlined in Maine. We feel that we don't have to be hopeless about this question of whether or not we can control pollution because we don't believe this is a fact.

In the State of New York at the present time we have an aggressive program in pollution control and abatement. Within the next year we believe there will be areas as much as 40 square miles which we will be opening for the taking of shellfish -- areas that have been closed for the past 40 years. There are possibilities and opportunities to reserve a portion of this area for shellfish cultivation, and I think we can't lose sight of this as part of our program.

The last item is this matter of depuration. Where does it fit into a program which would be carried on in the State of New York?

We don't know, frankly, where this fits into our picture at this moment. We feel we don't know enough about it in relation to the species we have; as for example, hard clams. As a consequence this year, in cooperation again with our industry who are working side by side with us, we are setting up a pilot plant for hard clams -- a depuration plant. We feel that there are many inherent problems in this matter of purification of hard clams, particularly in areas where we have a wide range of temperatures, with the clams being forced to hybernate during the wintertime, or something approaching this, and going through long periods of the year not breeding at all.

We have done some very preliminary tests through the cooperation of the State of Rhode Island and the Public Health Service and the Rhode Island Experimental Lab. I am sure you are going to hear about this next, and I will be brief. These tests indicated that we must have a great deal more study on the matter before we, as a responsible agency, could certify shellfish from a purification plant.

I might say that the State of New York had purification plants some 40 years ago at the time, or just about the time when the present certification program went into effect. They had some satisfactory results at that time in the purification of hard clams. I have talked to the people who participated in the operation of one of the early plants -- in fact our present study will utilize one of these plants and one of the original tanks -- and they thought this process at that time was not a desirable technique, and the process was abandoned by the industry and the State.

We believe that purification is not a panacea for the shellfish industry in the future. We must have a balanced program doing all of these things. Even with purification plants, if we have inadequate enforcement to prevent bootlegging -- this could bypass a purification plant as illegal operations bypass our control system today. If this happens the program would be of no value.

I agree with the previous speaker about the variability of living animals. Pasteurization of milk is one matter; pasteurization or purification of water is one matter, but when you are dealing with individual living animals they vary individually just like people!

APPENDIX I

RHODE ISLAND DEPURATION STUDY

By

Manuel T. Canario, Jr.
Department of Agriculture and Conservation
Division of Fish and Game
Providence, Rhode Island

The shellfish industry of Rhode Island depends almost entirely upon the supplies of the hard clam or quahaug, Mercenaria mercenaria. Since 1955, when a peak of five million and twenty thousand pounds (5,020,000) of quahaug meats were harvested there has been a gradual decline in amount harvested, and the number of diggers. More and more of our marine areas are in danger of becoming polluted, threatening the shellfish industry. Two major areas, the Providence River and Mount Hope Bay, are closed to shellfish harvesting due to pollution. It has been estimated that 600,000 bushels of quahaugs are in the polluted waters of the Providence River and 400,000 bushels in the Mount Hope Bay area.

In the hope that some of these quahaugs could be harvested and cleansed for market, the Rhode Island Division of Fish and Game assembled a pilot size quahaug purification plant, and in cooperation with the U.S. Public Health Service, is working on the development of techniques for the control and processing of shellfish. The unit consists of two plywood tanks with fiberglass coated interiors. Each tank is capable of holding twelve bushels. An ultraviolet lamp unit, patterned after the "Purdy" unit, was used to disinfect the saline water used in the purification tanks.

The question as to which process would be best suited arose. Should waste water be returned to the harbor after a single pass through the purification tanks, or drain and flush the tanks one or more times during the length of the trial, or recirculate the tank water continuously from the tanks to the ultraviolet lamp unit? Since the water had to be heated to operate during the winter months, it was decided that recirculation of the water continuously was the most expedient. Modification of the pilot plant enabled operation of one tank at 55°F. and the other at 70°F.

The influence of the tank water temperature and the rates of the weight of quahaugs to the volume of seawater, on the elimination of coliform organisms by the hard clams was investigated in a 2 x 2 factorial experiment. Five of ten trials had been completed before the suspension of the project since the specimens failed to show a high enough coliform reading to measure. This apparently was caused by the reduced syphoning of the clams as the water cooled. Periodic checks were maintained until by the 10th of May, 1964, when the numbers of coliform again rose to a sufficient level for analysis.

Shellfish for the experiments were obtained from a closed area in the Providence River. In the summer, coliform counts in this area indicated up to 10,000 per 100 ml. of flesh and 20,000 to 43,000 per 100 ml. of water. Yet, for example, tests taken on the 23rd of March, 1964, indicated a coliform count of 1.8 per 100 ml. in the quahaug and readings of 540 coliforms per 100 ml. for the surface and 79 coliforms per 100 ml. for the bottom samples of water in this area.

The water in both tanks was recirculated through the ultraviolet lamp chamber at 30 gallons per minute which correspond to a change of tank water three times an hour. Two submersible pumps in each tank provided circulation within the tanks. A preliminary trial without the submersible pumps showed that the dissolved oxygen in the strata containing the shellfish was quite low. Little dissolved oxygen stratification was noted after the pumps were functioning.

Respiration in the warmer water was greater, demonstrating that respiration is dependent upon temperature. At 22°C. Mercenaria mercenaria activity pumps for approximately 90% of the day, but with a drop to 5°C. activity decreases, and below 5°C. hibernation of the individual occurs.

Twelve quahaugs, in each tank, were numbered and observed for activity. Though the measurement of activity was rather crude, one could follow the increase of activity as the water warmed. The activity reached its peak before 48 hours and gradually lessened and by 72 hours most had ceased. The amount of dissolved oxygen in the water decreased as activity increased and increased as activity decreased.

Beginning with trial No. 8 difficulty was experienced maintaining the 7°C. temperature differential as both tank temperatures approached room temperature. As water temperature rose above 75°F. a new problem presented itself as the quahaugs spawned during the trials. Visual observations of the quahaug's movement became impossible at times. Dead shellfish in a tank tended to upset the trial if they were not removed, for the coliforms will multiply in dead quahaugs and possibly when spawn fills the tanks. This view is substantiated by the results of a study in storing two species of clams, Tapes japonica and Prothothaca staminea, of the Pacific Coast at 20°C. Coliform MPN counts increased by a factor of ten in one day. It is acknowledged that coliform counts of shellfish in-trade are expected to be higher than when harvested. If the coliforms do multiply then their numbers as a measure of pollution is largely negated. For this reason the determination of E.C. gas positive organisms is useful. The E.C. gas positive organisms did not seem to multiply in the present experiment.

It is our belief that such purification as is going to take place with the hard clams will occur within the first twenty-four hours. We were strengthened by our belief by the notes kept on the activity of the clams in the tanks where we noted the appearance of waste from the quahaugs, and something of their siphoning and oxygen consumption. Most fecal matter was expelled by the quahaug between the sixth and twentieth hour after entering the tanks for purification.

These trials showed that the ultraviolet system of water recirculation is a practical method of purifying the hard clam. Further tests should substantiate these findings. The process would help to allay consumers' fears of purchasing contaminated shellfish, and should be a boon to the shellfish industry.

APPENDIX J

INDUSTRY REPORT ON DEPURATION

By

Richard H. Loring
Aquacultural Research Corporation
Dennis, Massachusetts

I am speaking for the Oyster Institute of North America, the trade organization for the shellfish producers, processors, and distributors in the United States. We are all very much aware of the problems that are upon us with ever increasing population pressures causing an increased demand on the industry and at the same time, tending to decrease the available areas capable of producing shellfish. Our primary aim is to produce and guarantee a quality product which in itself will insure public confidence. The Institute's membership has been informed of the Public Health Service's present position that there is further need to safeguard the public when they consume shellfish, and that this further safeguard should be in the form of depuration. The industry has been polled and their ideas have been correlated in the following report:

We feel that the present certification program can be accepted by all parties--the Federal agencies, State agencies and the industry--in principal. The program as outlined could meet the problem if it were properly implemented. The Public Health Service has accepted the certification program and has accepted the States' responsibility in certifying clean waters. It appears fool-hardy to throw this concept to one side, when it has proved itself effective in all but a minute portion of the total industry. It seems much more practical and expedient to concentrate our efforts on eliminating the hazard caused by a very small fraction of the harvested shellfish than to underwrite an untried and untested depuration program. As far as anyone knows depuration will be prohibitively expensive and could conceivably put a large segment of the industry out of business.

But let us not use economic hardship as a factor for it should not exist where public health in concerned. We propose to analyze our present program and demonstrate how the problem can be solved with definite, positive steps. Ideally speaking, the certification progran can work. However, it does not resolve two major problems:

1. Continual loss of certified areas,

2. The continued temptation to exploit existing population of contaminated shellfish.

Our first problem encompasses the entire areas of pollution control and abatement. Our late President, John F. Kennedy, said that our water quality is the most challenging problem facing us right now. We are doing all we can to fight the pollution; we are doing all in our power to strengthen the Federal anti-pollution laws. Now the Public Health Service and other governmental agencies must do all they can as well. Many of the most ardent proponents of pollution control have been re-elected to Congress this year and thus there will be continued congressional interest in this critical area. However, the idea that we will continue to lose ground in maintaining clean shellfish areas may not be as true as it has been. We are trying to hold our own and reclaim lost areas. For example, next year it appears that all of the Westchester County shore of New York will be reopened all but 20% of that acreage in the near future. Pollution abatement programs are growing in number and in quality. Through education and the mass media there is an ever increasing public awareness of the problem. We therefore call upon the Public Health Service to aggressively pursue water pollution control and abatement as forcefully and as vigorously as possible.

The threat to health from polluted shellfish populations has several economically sound solutions. The relaying programs as pioneered by New York and Rhode Island have proved to be sound and effective. In a sense it is a depuration on a larger scale than any man made process. It is by far the most positive action we can take at the present moment, especially with the use of modern harvesting implements. By means of this one solution we can eliminate the temptation to harvest shellfish from contaminated areas by depleting the population below the level of economic value. In addition we increase the resource and availability of certified natural shellfish and at the same time create more jobs within the industry to make use of any unemployment in the areas. In one operation we achieve all our goals and have something extra to frost the cake.

If a contaminated product cannot be transplanted, for example the soft-shell clams from beds in parts of Massachusetts, (which are truly a public health menace) a drastic last resort should be to erradicate them entirely by poisoning. This seems quite a wanton waste of potential spawning stock, but it is a means to an end, and necessary.

To supplement the program of relaying contaminated shellfish populations and to avoid such drastic poisoning methods a depuration program can be developed. I say developed because at the present time the process has only been successful with soft clams and is commercially feasible because of the by-product of the operation - desanding. The hard clams and the American oyster, the two animals predominately utilized in the raw state, are not primarily winter feeders. Their reactions to the depuration process are unknown. What we advocate is a pilot depuration program, such as that being set up in Long Island. We want to be able to observe the results and evaluate them. Past experiences in "floating" shell stock, a process similar to depuration, showed oysters survived fairly well, but that hard clams became poor in condition with accompanying high mortalities and a greatly reduced shelf life. Therefore, let us find out what depuration can do under the varying conditions of seasonal changes and geographic locations. Water temperature is going to be a prime factor--can it be warmed enough in the winter months to do the job economically? What condition would the clams be in after the process? And finally, would the process once and for all purify a contaminated animal and make it safe for human consumption? These questions are altogether too basic and yet unanswered. In truth, the industry has the responsibility to work with the States to insure that the program does work. Suppose, for example, we tried depuration before it is tested--private enterprise invests large sums of money in plants and equipment--and it doesn't work. We would have taken large stocks of clean shellfish and made them unfit for market. Do we use any shellfish and hope the contaminated stock comes clean? We would never know since the conclusive results would not be found until 96 hours after the clams have left the plant. We still would have to maintain strict vigilence over the contaminated areas because depuration, by creating a more expensive product, would only encourage bootlegging. This process like the certification program, is based on public integrity. The very small minority of violators lacking this integrity would still florish while the conscientious members of the industry--those who at present are cooperating fully with the program--are being saddled with a white elephant. The problem will not be solved this way.

In addition to the relaying program and pilot depuration process, we urge closer inter-agencies communications on the State level. None of us can avoid the consequences of a mistake such as Pascagoula, Mississippi, when a breakdown in a sewage treatment plant was not noted in time to close shellfish beds. We must have effective cooperative efforts as regards water surveillance and reviews. In this case, accidents cannot happen.

Once we have removed most of the contaminated shellfish, we are still threatened by a fraction of the production being illegally harvested. How is this to be combated? We recommend a central landing area for certification in conjunction with the existing certification program. This operation would check the shellfish as it comes ashore at specific sites. An officer could stamp the tags approved upon rating the product. This then would permit an easement in taking sanitary samples, and it would lay the basis for some stringent laws that any shellfish not passing through these legally controlled points be subject to immediate confiscation. Perhaps a fee or tax could be placed on each bushel landed to help defray the additional cost and great mechanical problems which this sort of program would entail.

No matter which of the suggestions are adopted we believe more can be done by the State and Federal authorities. More cooperation is needed between the three groups. More is needed in the way of seizing shipments, policing restricted areas, and perfecting the tagging program. Tags are put on containers at the source and in some cases have been replaced with others to keep the customer from knowing the source of the stock. To prevent violations obviously means to increase the police force. It is suggested that Federal funds be used--on a matching basis with the States--to help them improve their law enforcement and for technical assistance. We do not believe that the States can do the job of policing the certification program without additional help.

There is already stringent Federal inspection of opening facilities now. If this inspection went two steps further and inspected the areas and the boats the results would be far reaching. The mere presence of more law enforcement personnel would reduce the temptation of illegal harvesting.

Increased man power can be accomplished by a cooperative program with local police, in addition to conservation officers, supplemented with more sophisticated surveillance equipment. We must reemphasize the seriousness of the crime of bootlegging resulting in the possibility of disease transmission, and utilize all law enforcement agencies and their facilities to combat illegal shellfish. More stringent retribution to the offender is a necessity. The Public Health Service can help the States in an active educational program for law enforcement to promote local understanding. Our judges must realize the importance of tight control and be cognizant of the health threat that is created by the violator. Bootlegging should no longer be considered merely a poaching offense, but be made a more serious offense and the fines and/or jail terms should reflect this. In summary then, we believe that:

1. The Public Health Service Cooperative Shellfish Certification Program can work,

2. Pollution control and abatement should be pushed harder,

3. Relaying programs should remove contaminated populations wherever possible,

4. That depuration be tested and researched,

5. Central landing areas for certification be established where practical,

6. Drastic action be taken against unauthorized persons caught removing shellfish from polluted areas,

7. Federal assistance be made available to the States in their policing programs.

We recommend the adoption of these seven points, as well as recommend much more stringent law enforcement backed up with an enlightened court to wage a strong battle on the few offenders that would risk human health and the future of the entire shellfish industry for a few quick dollars. We are plagued with some dirty shellfish and dirty people, and must remove both. The industry has presented a progressive, logical program which may differ from that of the Federal government and the States--but an amalgamation of the thinking of the three groups will produce a program that will be effective and strong.

APPENDIX K

POLLUTION CONTROL AND WATER QUALITY OBJECTIVES

By

Wesley E. Gilbertson, Chief
Division of Environmental Engineering
and Food Protection
Public Health Service

The absolute need for maintaining satisfactory sanitary quality at all times in those areas from which shellfish are grown or stored is one of the most important elements in the Cooperative Program. Not only is it important from the standpoint of public health, but also from those of "setting," rate of growth and taste of the final product, and we are all interested in shellfish that are safe, plentiful, and delectable.

For a variety of reasons a discussion of water quality in the coastal areas of the United States--when expressed in terms of the consumer protection goals of the Shellfish Sanitation Program--becomes one of great challenge. And it is a topic of challenge within almost any frame of reference! In terms of size we are dealing with a coastal strip of the United States in which about 45% of the population resides, and presumably in which an even larger percentage of industrial capacity is located. In terms of economics, we talk in terms of millions of dollars of expenditures for water quality control on the one hand, and the livelihood of perhaps 200,000 people on the other hand. Anyone who thinks that the problems of water quality in the estuaries have no political or social implications needs only to read the 1964 reports of the House and Senate hearings on water pollution control legislation. In terms of technical problems, the water quality requirements of the shellfish sanitation activity are so demanding that they present, at times, an almost impossible challenge to the design engineer. In terms of group interest, we find the conservationist and yachtsman--groups that have championed the cause of clean water--are significant contributors to estuarine pollution due to primitive waste disposal practices afloat. Even the septic tank--the specter of the suburbs--is a major source of trouble on many of the watersheds of shellfish producing estuaries.

As it is so often the case, we can best understand our present predicament by an examination of the past. In our case the history of our shellfish sanitation program, insofar as water quality is concerned, divides itself nicely into four or five periods; pre-sewers, sewers, sewers plus rapid population growth, and sewers plus treatment plants plus population growth.

The first of these eras was a happy one for the shellfish industry and for the public health officials concerned with the safety of the product. The coastal population was small, there were few community sewer systems and consequently there were few problems of pollution of the shellfish beds. This happy period ended in the late 1800's when health authorities in several parts of the world found out what happened when shellfish holding grounds near cities became polluted. It was the dawn of public health and it was the dawn of a long era of problems with water quality in our coastal areas. However, areas involved were infinitely small when compared with the total coastal area available for shellfish use.

The second era was the period of rapid growth of the major coastal cities, and the development of effective water supply and sewer systems. In this period great volumes of untreated sewage reached the coastal waters and the conflict over multiple use of the estuaries became reality. However, the areas involved were still small in terms of the total shellfish areas and no one was too concerned by this "loss."

Our transformation from the second to the third era was so insidious that only a few people realized a change was taking place. The population growth of the coastal cities continued with suburban developments rapidly spilling over into formerly rural areas. The increased leisure time, a by-product of the short-work week and a high level of economic productivity, the automobile, and the modern highway system all combined to multiply this impact. Thousands of people were suddenly aware that they had the money and time to live near the shore. In addition, the large outboard motor made boating a practical recreation for many of these families. Thus, new sources of pollution were brought to all but the most inaccessible of the shellfish beds. These developments took place slowly. A few areas closed here and there until, at least in some States, there was no place in which to retreat.

While the shellfish industry faced a tightening squeeze, the technical position on shellfish sanitation, as such, was still tenable. When raw sewage is discharged into an estuary--and flows are "normal"--a relatively constant level of pollution becomes established. Field studies and laboratory examinations readily identify polluted areas and permit the control agency to close them to harvesting. (The problems of effective patrol insignificant when only small areas were closed, assumed impossible dimensions as the ratio of open to closed areas diminished.)

The fourth era marked the awakening of the American public to the need for pollution control and abatement to save the water resources of the Nation. To those concerned with shellfish sanitation, it was also the end of the steady-state situation. No longer could a relatively simple sanitary survey suffice to determine the sanitary quality of an area. We had the long-delayed awakening of public interest in the problem of preserving the Nation's water resources. Waste treatment systems were absolutely necessary to handle the pollution load. We entered the twilight zone of the conditionally approved area concept, which involves consideration of satisfactory operation of the waste treatment plants. This carried with it the need for a complete change in the concepts under which the shellfish sanitation program had operated. The change from the "steady-state" level of pollution which one can expect with raw sewage discharge to the "variable state" level which accompanies sewage treatment, in short, has many administrative and technical problems associated with it.

If the discharge of sewage (treated or otherwise) from our municipalities was the sole determinant of water quality in the estuaries, the problems would be serious enough, but that is not all. The very presence of a large city carries additional elements of contamination which cannot be entirely controlled by the treatment of the sewage. We are learning that in many areas the wash-off from a major city following a heavy rain also carries great quantities of polluting organisms. It is true that this pollution may not have quite the same public health significance as does the contents of the sanitary sewers. Nevertheless it does contribute to the overall problems and most certainly, the presence of these indicator organisms also obscures the true sanitary quality of the estuary. While we can consider facilities to treat some of the storm flows, especially with combined sewers, at present there is no practical approach to the matter of treatment of all water which runs off of our city streets and buildings. Then, too, we have the largely unevaluated problem of run-off from agricultural fields and forests, which is no longer laden just with simple silt and vegetable organic matter.

The problems of sewage disposal from boats has been mentioned. I will not bore you with statistics on the numbers of small craft which now use our protected waterways. All who are acquainted with coastal developments know of the large increase in the number of boats and in marinas established to service these craft. You also know that many of these boats have flush-type toilets, and that they are a source of pollution. It is true that the total sewage discharge from these boats is small in comparison with the sewage discharges from our big cities. However, it is equally true that in many cases these craft are only a few feet above the habitat of living oysters and clams. Thus, the protective elements of die-out and dilution are not aiding us the same extent as with sewage effluents from shore establishments. The problem is recognized and some steps are already being taken to develop sewage treatment devices which can be installed on these boats. However, it seems that it will be many years before these devices will be installed on all craft, and even then there will be the residual problem--and it may not be an insignificant residue--of policing the operation of these units! This is an area in which we feel that a concerted effort should be made to develop suitable corrective devices and that the installation and use of such devices should be required by State or Federal law.

Finally, you might ask the inevitable question. So who gets sick? We have only one well-established episode, to the best of my knowledge, which traces typhoid to such pollution. However, we know the potential exists and who is to say that some of the un-explained cases of infectious hepatitis or other enteric diseases might not be attributable to this problem.

I do not want to leave you with the impression that we are concerned only with pollution from pleasure craft. In some areas commercial shipping, naval vessels, or fishing boats may constitute an equal hazard. Under the provisions of the Interstate Quarantine Regulations, the Public Health Service is required to take necessary action to prevent the spread of a communicable disease from one State to another. The Service has for many years met this responsibility through surveillance and control of health problems incident to the interstate movement of vessels. The problem of proper disposal of sewage wastes from vessels was highlighted with the opening of the St. Lawrence Seaway which resulted in increased traffic on the Great Lakes by vessels of both American and foreign flag registry. At that time it was feared that this new traffic would greatly increase the possibility of sewage being discharged in the proximity of municipal waterworks intakes in the Great Lakes. In August 1960, a new section was added to the Interstate Quarantine Regulations restricting the discharge of sewage, ballast or bildge water from vessels within a three mile radius of some 150 potable public water supply intakes of that great fresh water resource.

There has been an increased interest on the part of local, State and Federal authorities in problems created by sewage discharges in local harbors, the inter-coastal waterways, and the inland rivers. To provide a mechanism to consider this problem, the Public Health Service established in 1960 an Interdepartmental Committee on Sewage and Waste Disposal from Vessels, consisting of representatives from the Corps of Engineers, Department of the Army; Bureau of Ships, Department of the Navy; Bureau of Medicine and Surgery, Department of the Navy; U.S. Coast Guard, Walter Reed Army Institute of Research, Department of the Army; U.S. Maritime Administration, Department of Agriculture, Conference of State Sanitary Engineers, and the Public Health Service. The Committee has met five times and has arrived at a recommendation that all new vessels, or vessels undergoing major conversion, subject to the Regulations, should be provided with sewage treatment or retention facilities.

At this time, our Division is proceeding to amend the Regulations so that all new vessels undergoing major conversion, that will operate in interstate traffic under the terms of the Regulations, must be equipped with facilities to treat wastes from toilets, urinals, facilities in hospital areas holding fecal material, and wastes from garbage grinders when such grinders are installed. It would require that these facilities be designed, constructed, operated, and maintained in a manner to produce effluents meeting minimum criteria. Instead of treating wastes, it would also be permissible to provide holding tanks properly equipped with pumps and piping so that the wastes can be discharged to approved shore-based or floating installations or in restricted areas, such as the high seas. These Regulations should become effective early in 1965.

Fishing boats are also cause for concern. These boats are usually small and can carry no disposal facilities. But this does not repeal the biological laws of nature! Recently we had a small outbreak of typhoid fever which was apparently attributable to the sanitary practices--insanitary practices is a better term--of a tonger who was a typhoid carrier. While this is not a major pollution source, in terms of numbers, the absence of the safety factors of dilution and die-out gives it public health significance.

Septic tanks, and their poor cousins, the cesspool or overboard disposal, imperil shellfish areas in some parts of the country. Nationally, much of our concern with such disposal systems has been in the suburbs of our great cities. However, we also know that--to mix up an idiom-sometimes entire estuaries are islands in great seas of individual sewage disposal systems. While it is relatively easy to check on the operation of a few of these systems, the task takes on staggering dimensions when an entire watershed becomes populated. To some extent this problem can be limited through the applications of stringent controls on the construction of the units and the firms responsible for their maintenance and cleaning; however, even this approach has its limitations.

We are truly on the horns of a dilemma when we must choose between septic tanks, ground water pollution and local environmental health hazards, and the water quality problems which we associate with effluents from sewage treatment plants.

Last is our concern with chemicals--and I include in this term radioactive materials, pesticides and waste chemicals from industries. We know that many of these chemical materials have long half-lives, and that they may be accumulated by shellfish from the water. It is only within the last few years that we have really become concerned with this problem. We do not yet know as much about it as we should; however, the studies and monitoring programs which are now being carried on do give us some information on the extent and nature of the problem. At least, we recognize this to be a problem and are moving in the direction of establishment of baselines and water quality standards. The experiences with pesticides during the past few years demonstrates this situation quite well. We realize that shellfish have an unusual ability to concentrate many materials from the water and we must be prepared to undertake and maintain programs which will measure levels of these materials if we are to continue to use shellfish as food. I want to add that the word shellfish may be too narrow in this context. Chemical contaminants may have an adverse effect on all marine foods. In summary, the day in which shellfish growing water criteria can be defined solely in terms of microbiological parameters has passed. We have necessarily, perhaps unwillingly, entered a new and more complicated period.

To complete our background discussion we must also mention the concept of multiple use. This idea as it applies to our fresh water resources has generated much discussion among the professions and the public. While there has been less discussion of the problem as it applies to the estuaries, I suspect that the same forces exist. Just as with fresh water it is improbable that any one single interest group will be able to reserve a major portion of the water resources for their exclusive use. By the same token, it also seems unlikely that any single group will be able to maintain the right to so modify these waters as to make them unsuitable for other uses. I think this will mean the shellfish industry can expect acceptance of their water quality needs by other groups also interested in the use of these waters, but that there is little hope that they can have what amounts to exclusive rights to use of these waters. One can argue the merits--or hazards--of such a situation; but, I do not think that the shellfish industry will be especially successful in effecting "exclusive jurisdiction." In fact, they may find they will be faced with real difficulties in keeping their own needs sufficiently in the public view to assure their survival.

Initially, the goals of the Cooperative Program were to assure that shellfish would not make people sick and, from the industry standpoint, result in a loss of the consumer market. This was accomplished by sanitary surveys of the growing areas. Those few areas which were not of suitable quality were than put off limits to the shellfish industry. Thereby--and this is an example of twenty-twenty hindsight--the founders of this program committed themselves to a course of negative action insofar as sustained water quality of the estuaries was concerned. Let me emphasize that this decision was made--apparently by accident and likely without the realization that a policy decision was being made or a precedent established--by a committee with representation from the States, the shellfish industry, other Federal agencies, and the Public Health Service.

This passive policy has been maintained by the Cooperative Program throughout its history. We find not any real evidence that any of the several parties to the agreement have challenged this position or suggested a more positive course of action. At no point in the several editions of the Shellfish Manuals is there anything which suggests that this Cooperative Program should modify its passive position in favor of one aimed at preserving the qualities of the estuaries. Now this is not the same as saying--and I want to emphasize this point--that these same agencies have not been interested in pollution control. They have and we all know it! But their concern has frequently been with the general concepts of pollution control rather than the specific water quality needs of shellfish production and harvesting.

Recently, many of the groups interested in the sanitary quality of shellfish have come to the realization that the generalized goals of the pollution control were not quite the same as the consumer-oriented goals of the shellfish sanitation program. In the Public Health Service we became acutely aware of this through the program for providing financial assistance for construction of sewage treatment plants. In some cases communities expected more of minimal (or even more complete) sewage treatment facilities in terms of water quality in nearby shellfish growing areas, than could reasonably be expected, and were disappointed, and sometimes embarrassed when these expectations were not fulfilled. In a few instances the construction of new sewage treatment plants resulted in the closure of additional shellfish growing areas, because the design did not seem to deal specially with the unusual problems of estuarine waste disposal as related to shellfish harvesting. In any event there has been an imperfect exchange of information between the pollution control and the shellfish sanitation agencies. This was apparent to us several years ago in our attempt to develop the Conditionally Approved Area concept when we surprisingly found a lack of enthusiasm on the part of many State control agencies and the shellfish industry.

The 1963 Oyster Institute meeting seemed to be a turning point insofar as industry interest in pollution control was concerned. It seemed that a major part of the discussions--both formal and informal--related to the pollution problems. A bench mark was laid down in October 1963 at hearings before the House Subcommittee on Fisheries and Wildlife Conservation, House Merchant Marine and Fisheries Committee in which most of the witnesses testified that pollution was the major problem facing the shellfish industry.

In the Division of Environmental Engineering and Food Protection we have given a great deal of thought to this problem and have had numerous conferences with our coworkers in the Division of Water Supply and Pollution Control and Division of Radiological Health. As a result of our past experiances and recent discussions, we feel that we have an understanding of the problems and of possible corrective actions. These are the things that we think need to be done:

1. We need to formulate precise definitions of water quality criteria, including those elements of sewerage system design which will determine the effectiveness of the system in terms of water quality objectives, as related to shellfish needs.

2. We need to make a determined effort to see that water pollution control agencies and design engineers understand the water quality criteria of the shellfish program.

3. We need to see that these water quality needs of the shellfish program receive proper recognition in long-range water pollution control planning or water resource planning.

4. We need to support and encourage programs for the prevention and abatement of pollution.

5. We need to support programs at the State and Federal levels which will assure that waste treatment plants are operated in accordance with the design goals of the shellfish programs--and we do not feel that the agency responsible for the shellfish program should take the word of another agency (State or Federal) that these plants are, in fact, operated effectively. The shellfish control agency must necessarily have a "show me" attitude, although we recognize that it is not the responsibility of the latter group to oversee the operation of treatment plants.

At the Federal level we have proposed a course of action which, if the necessary resources can be obtained, should be effective in each of the above areas. Specifically, we expect to utilize our research resources to the maximum extent possible to define water quality goals; to get better publicity for the program at professional meetings; to take a more active part in the water pollution control enforcement actions and comprehensive studies; and, to review applications for construction grants under P.L. 660. In the Public Health Service during the past year we have had a constructive response to these ideas from the Water Pollution Control Division and we hope to progress at a higher rate during the next fiscal year. We commend a similar course of action to the States.

We are also considering the development of a system which will give us better intelligence on the water quality trends in the Nation's shellfish growing areas. In the past, our program planning has been handicapped by a lack of information on the extent of the Nation's shellfish growing resources, the quality of these areas, and of the trends in both quality and productivity. We feel that sound planning requires sound information.

Our thinking in this area is not fully developed, but we expect that the States would be able to provide the basic data, both through contract and through the Cooperative Program, and that one of the other Federal agencies would probably handle the data processing. For example, we have had several meetings with the Basic Data Branch, Division of Water Supply and Pollution Control, on the development of a uniform system for the identification of sampling stations in the estuaries. If the States can agree to the use of such a system, the entire problem of keeping track of water quality problems in the Nation's shellfish growing areas will be greatly simplified. Incidentally, such a system would also be of material assistance to PHS in the evaluation of State programs and would help assure that valuable data would not be lost due to sheer volume and lack of a suitable system of data handling.

Last, perhaps most important, is the need for the people involved with shellfish programs to declare a position on this whole subject of maintaining water quality. This is undoubtedly a long overdue action. Mr. Jensen has made such a proposal in connection with the revision of the Shellfish Manuals.

Finally, I want to say a few words about depuration. We have talked about this quite a bit in recent years and we realize there are many unanswered questions. However, is is our opinion that we have no other real choice unless there are some unimaginable breakthroughs in waste treatment technology. In general, we think our technical goal should be to require all shellfish, which might be consumed raw, to be submitted to such a process before marketing. This is not a substitute for effective control of pollution any more than a municipal water treatment plant is an argument against pollution control! Instead it is a consumer-protective device which seems to us to be the only feasible way to maintain a satisfactory confidence factor in the Cooperative Program. Admittedly, this is a great departure from past commercial practices in this country.

In summary, we cannot and need not take a defeatist position on the problem of maintaining satisfactory quality in estuaries used for shellfish culture. There are, in fact, many positive steps which the shellfish interested groups can take to work more effectively with the pollution control agencies. These steps, coupled with the depuration process, should insure a safe supply of shellfish into the foreseeable future. But they will not be cheap, and they will not be easy!

APPENDIX L

ADVANCES IN OYSTER CULTURE

By

David H. Wallace
Division of Fish and Game
New York State Conservation Department
Oakdale, New York

INTRODUCTION

Production of oysters on the East Coast of the United States has declined gradually since about 1900. This downward trend has been most drastic in the area from Chesapeake Bay north through New England. The quantity of shucked meats produced in Chesapeake Bay has dropped from about 115 million pounds in 1880 to over 18 million pounds in 1963. The drop in production in the Long Island Sound area took place more recently, but has been precipitous and disastrous to the industry. Landings in New York as late as 1951 amounted to 1,252,000 bushels. In five years production dropped to less than 150,000 bushels, and the harvest in 1963 amounted to only 53,000 bushels.

The industry and State conservation agencies have been forced to evaluate their conservation practices, and to analyze the reasons disccused here, although some production problems will be mentioned to emphasize the motivations for advances in oyster culture. While some progress was made in limited situations, our oyster cultural practices have been far behind those of some major oyster-producing countries. Pollution, predators, destruction of the environment by dredging, and diseases have been other contributing factors, and in some situations have eliminated oyster production.

In the last twenty years there has been a strong resurgence in thinking on the part of biologists, administration, and industry leaders that new techniques of oyster culture must be developed and perfected if the oyster is to retain any semblence of its former position as one of the most valuable fishery products in the United States. In this report an attempt will be made to point out some of these recent advances and to project their significance in terms of future productivity.

One of the paramount problems of the industry and the States has been the failure to produce adequate seed oysters for planting on the fine growing grounds. This condition has been particularly acute in New England. The consistent failure of the private and public seed grounds in Long Island Sound off Connecticut for the past twelve years has resulted in the reduction of oyster production to a mere trickle as compated with the late 1940's and early 1950's.

While there has been a period of pessimism in the industry, this thinking is becoming more optimistic with the development of new seed-growing techniques perfected in the last five years.

POND CULTURE OF SEED OYSTERS

In 1897, H. F. Moore of the U.S. Commission of Fish and Fisheries wrote:

> There are indications, however, that in certain portions of our oyster belt it may be necessary to follow some method of pond culture ... Should the feasibility of this be demonstrated under conditions prevailing in the United States, a vast increase could be made in our oyster supply..." Moore further stated, "By some modification of pond culture it may also be possible to raise seed oysters in regions in which few or none are now produced, thus adding another considerable item to the wealth-giving powers of our coasts."

While Mr. Moore's thinking was not practical in his time, some sixty years later rapid strides are being made in New York to use salt ponds for seed production. From 1944 through 1949 in South Carolina, Mr. C. Robert Lunz attempted to cultivate oysters in salt ponds with some limited success. Subsequent studies by the Bureau of Commercial Fisheries in New England were initiated in 1956 by Mr. Paul S. Galtsoff and Mr. William N. Shaw to perfect the techniques for seed and market oyster production in salt ponds. Similar studies were made in other locations in New York and Chesapeake Bay by the Oyster Institute of North America. These studies were directed toward an adaptation of the suspended method of seed production used in Japan to conditions prevailing for the Eastern oyster (Crassostrea virginica).

Commercial seed oysters in tributaries of Chesapeake Bay were produced from 1954-56, using wire bags on the bottom. Sets counting four to five times those of shells on the bottoms were obtained. This method of growing seed is still being used commercially in some parts of Northern Virginia. Even more extensive quantities were produced by the wire bag method in lower Delaware Bay during the same period. However, the bag technique was practically abandoned in Delaware Bay when MSX disease almost eliminated all oysters in the lower Bay.

Commercial production of seed on cultch suspended above the bottom has progressed rapidly in a salt pond at Fishers Island, New York. In this pond the Ocean Pond Corp. has adapted the Japanese technique for use in a self-contained salt pond, where the larvae are retained within the confines of the pond during their free-swimming stages. The results have been phenomenal. Scallops and oyster shells strung on wires and hung beneath styrofoam rafts while the larvae are in the free-swimming state, have collected sets averaging fifteen spat per shell. The first commercial high count seed (3,000-5,000 per bushel) was sold to Connecticut and New York oyster farmers in 1963. This company repeated its success in 1964, using the same method, and has already sold its crop of 7,500 bushels.

This practical demonstration of the suspended cultch method of seed production has stimulated other efforts in this direction, since the demand for seed exceeds the supply in all of New England. The New York State Conservation Department, working with the Town of Southampton and the local baymen in the town, has produced substantial quantities of seed this summer in a salt pond called Mecox Bay. The salinity of the water is maintained at the appropriate levels by opening or closing the ocean barrier beach. The pond is kept closed when the larvae are in the water. This project has demonstrated again the feasibility of salt ponds to grow seed oysters. Cultch was placed on the bottom of the ponds in bags tied together so that they would remain upright, and strings of shells suspended in the water. The results demonstrated that this pond has potential for development as a source of seed. Furthermore, the suspended cultch obtained sets four to ten times as heavy as the bottom cultch, and two to four times as great as the cultch in bags. The baymen are making plans to translate this pilot demonstration into a commercial operation. And so, the search is on for ponds which can be used for this purpose. It has been estimated that at least ten ponds exist in New England suitable for growing seed commercially. If each one could be developed to produce only 5,000 bushels per year, the industry would have a good start toward conquering the seed problem.

OYSTER HATCHERIES FOR SEED

The catastrophic failure of the Connecticut seed beds in the early 1950's stimulated other government and industry scientists to efforts to produce seed under controlled conditions. Out of these studies, begun at the U.S. Fisheries Laboratory at Milford, Connecticut, in about 1952, and independently pursued by Mr. Joseph Glancy of West Sayville, New York, a few years later, a commercial hatchery technique has evolved on Long Island. Three oyster seed hatcheries, using the Glancy method, operated during the summer of 1964. One other pilot plant hatchery also produced hundreds of bushels of seed using a modified Milford method.

The Glancy method was pioneered by the Bluepoints Company, who have produced several thousand bushels of seed annually for the past five years. Although precise figures are not available, the Long Island hatcheries undoubtedly produced close to 15,000 bushels of high count seed during the past season. The exact method used is retained by those associated with the Glancy estate, but the whole concept is relatively simple. Oysters are induced to spawn in the laboratory, the larvae are protected during their metamorphosis, and just prior to setting cultch is placed in the tanks so that the larvae can cement themselves and begin their sedentary existence.

The hatchery technique holds great promise for the future. It may eventually supplant the pond technique of seed culture, since the adverse factors limiting survival of the larvae are most readily controlled in a closed system than in even the open waters of a salt pond. Future advances should be forthcoming rapidly as the new pilot plant for shellfish culture is completed as an addition to the present Federal laboratory at Milford, Connecticut. Selective breeding to develop fast-growing, disease-resistant strains should become a reality. When this comes about, we may be facing the "Golden Age" of shellfish culture.

OTHER ADVANCES

Although salt-pond and hatchery developments are helping to conquer the seed problem, oysters in the United States are still grown and fattened on the bottom. In many ways this procedure is old fashioned and archaic, since the oysters are immediately available to attack by predators such as the oyster drill, starfish, or black drum. Extensive efforts have been made by the shellfish farmers over the last fifty years to control drills and starfish, with only limited young seed up to their first year of existence.

For the last ten years, scientists at the Fisheries Laboratory at Milford have been conducting tests to discover some method of biological or chemical control of these predators. For the past two years, the Bureau and the industry have been field-testing a chemical with the commercial name of Polystream. While it is too early to predict the usefulness of this chemical, it offers some promise in reducing predator mortality of seed oysters during the first year on the bottom. Further testing is needed to determine whether or not this technique is commercially feasible.

FUTURE PREDICTIONS

It is quite apparent that we will not have attained our full potential in oyster culture until we can produce seed under completely controlled conditions, eliminate diseases and predators, reduce materially the time between spawning and marketing mature oysters, and produce a "fat" product free of pathogens. It would seem that the only way in which this can be accomplished is to spawn and grow oysters to market size and condition in a self-contained facility, where physical, chemical and biological conditions are all controlled at the most desirable level for this species. Mr. Don McKernan, in a speech presented before the Oyster Institute of North America in 1961, predicted that by the year 2000 such oyster factories would be operating in various areas of the country. It is my belief that Mr. McKernan's proposals, which were considered the ideas of a dreamer in 1961, will be viewed in 2000 in about the same manner as we view today the thoughts of Mr. Moore in 1897. The period is not too distant from the reality of factories which will produce succulent, delicious, purified oysters for the consumer--gourmets and average folk alike.

Appendix M Omitted

APPENDIX N

ADMINISTRATIVE AND MANAGEMENT PROBLEMS IN THE NATIONAL SHELLFISH SANITATION PROGRAM

By

Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

The purpose of this discussion is to identify the major management and administrative problems in our shellfish program; to seek the council of the States, industry and other Federal agencies in meeting these problems; and try to agree on suitable courses of action. Specifically, we want to discuss (1) the management of the National Workshops, (2) guidance of the National Program and relationship of the National Workshop to the State meetings, (3) the name of the program, (4) the inclusion of plant sanitation ratings on the list of certified shippers, (5) financing of State programs and the relationship to legislation, (6) a mechanism whereby interim decisions can be made in the National Program, (7) representation by consumer groups, and (8) the concept of the "State Plan" as a prerequisite for program participation.

PROGRAM MANAGEMENT

Overall guidance of the National Shellfish Program is probably the most important of these management topics. This program was established in 1925 by a specially appointed "Committee on Sanitary Control of the Shellfish Industry in the United States." This Committee* met on several occasions in 1925 and submitted their formal recommendations to the Surgeon General. Actions on these recommendations by the Surgeon General established and implemented a National Shellfish Sanitation Program. Thus, all interested parties had an opportunity to participate in drafting the "charter" for the current program. A supplementary report was submitted to the Surgeon General on August 15, 1927, but we have no further record of committee activity. Perhaps it too died in the Great Depression.

While the establishment of the program is well documented, we have not been able to identify the mechanisms used for program management or to trace all the steps which lead to our present concepts of State program endorsement. However, we do know the PHS did obtain advice through the Shellfish Committee of the American Public Health Association, the Conference of State Sanitary Engineers, and from meetings which were called from time to time by the Public Health Service to discuss special problems; e.g., the 1940 Conference on Floating, the 1940 Conference on Laboratory Methods and the 1943 Conference on Paralytic Shellfish Poison. Also, the program had a formal advisory committee for many years, but it appears that this group was concerned mostly with laboratory methods.

This program management system seems to have worked quite well in the less hurried--certainly less complicated--1920s and 1930s. However, by the 1950s it was evident that almost everyone concerned was dissatisfied. Thus, a Second National Shellfish Sanitation Conference was called by the Surgeon General in 1954. The meeting was well attended by senior representatives of many of the States, other Federal agencies, the Government of Canada, and the shellfish industry. There seemed to be general agreement among those attending that more frequent National meetings were needed to give the States, the shellfish industry, and other interested Federal agencies an ample opportunity to participate in plotting the course of this cooperative program.

---

* The Committee included representation from the following agencies and firms: Oyster Growers' and Dealers Association of North America, Bureau of Fisheries, New Jersey Board of Shell Fisheries, Department of Agriculture, Oyster Dealers and Protective Association of Louisiana, Public Health Service, and State Health Departments of Louisiana, Maryland, Kentucky, and Illinois.

It was quite apparent to those of us who attended the 1954 Conference that there was also a strong need for equivalent meetings on a regional level. Fortunately there was precedent which indicated that such meetings were quite effective. The Chesapeake Bay States had been holding such meetings since shortly after World War II, and they had achieved a reputation as a successful means for expediting Federal-State-Industry communications. An effort was therefore made to extend this plan to the Regions. At present, shellfish sanitation meetings are held annually in each of the production areas; i.e., New England, North Atlantic, Gulf Coast and West Coast. However, the relationship of these State meetings to the National Workshop has never been defined, nor is such a relationship necessarily present. In some instances, these meetings are strongly oriented to the Workshop, with PHS having an important role in scheduling and organizing. In other instances, the meetings are essentially State oriented, with PHS present only in an advisory capacity. The relationship of these meetings to industry is even less well defined.

Our present shellfish sanitation program is founded on the principles of common goals, common interests, mutual trust--but subject to audit--and communications between all interested parties. Beyond this, our program is not well defined and there are no formal agreements as to the mechanisms for management or decision making. In fact, we are only now getting around to formalizing the procedure to be followed by the PHS in the evaluation and endorsement of State programs. This in itself has been a long and tedious process and one which is still far from completion.

Our informal approach to program management has been reasonably successful. However, we believe that our overall National program would be strengthened materially by a better defined management procedure. This should help to avoid misunderstanding, give an adequate voice in program management to all interested parties including consumers, bring a higher degree of expertese to bear on administrative problems, and help assure that we will continue to have a National, rather than a Federal, sanitation program.

On the basis of our recent experiences we recommend the Workshop endorse the following proposals:

1. Recommend that PHS give strong consideration to the establishment of a senior advisory committee on the National Shellfish Sanitation Program. This committee would not be a decision-making body, but would advise the Public Health Service on overall administration of this activity, help plan the National Workshops, and help coordinate the National and regional meetings. The committee should have representation from each interested group; i.e., State Health and Conservation agencies, Federal agencies, the shellfish industry, and the consumers. Considerations should also be given to establishment of an executive committee from the committee membership. The committee might well include representatives from each of the regional production areas, Northeast, mid-Atlantic, Chesapeake Bay, South Atlantic, Gulf and West Coasts, with some additional distribution and consumer representatives from the mid-West.

2. Give official recognition to the relationship between the regional and National meetings and endorse the concept that program changes will be made through the mechanism of National Workshops and associated regional meetings. Regional meetings should be planned jointly by all interested parties and should be scheduled in phase with the National Workshop. Unless there is an expression to the contrary we would continue to schedule the National meetings in Washington in the late fall--probably at two or three year intervals.

3. Request that PHS prepare an operational manual to define the procedures to be used in making changes in the National program. The proposed manual should be discussed with State agencies and other interested parties and brought before the next Workshop for consideration.

4. Recommend that PHS investigate the possibility of using PHS lists of State certified shippers to inform industry of National meetings and of any significant changes to be made in the program. This would help avoid the charge that many industry members are poorly acquainted with their role in the cooperative program and that technical changes are made without their knowledge.

NATIONAL WORKSHOP

Another similar problem is related to the conduct of the National Shellfish Sanitation Workshops. In general, it has been our experience that any changes in the Cooperative Program standards are best made through application of "law of the situation" rather than compromise or majority rule. In effect, each of the major participants is thereby given a veto power.

We could adopt a more formal approach for future meetings, but this would raise many questions as to "rights" of the various program participants and of the "authority" of the State and industry representatives to commit their agencies to a course of action. Rule of the situation seems to avoid these problems as long as all parties concerned will show a reasonable degree of cooperation. Questions necessarily arise as to the type and number of industry representatives, particularly from those few States in which the primary trade associations (the Oyster Institute of North America and its affiliated associations) are poorly represented. These problems have been discussed in varying degrees with the States and industry in the series meetings which proceeded this Workshop. While there is general agreement that these are problems, there have been few concrete suggestions for improvements except for the recommendations from one of the industry meetings that an advisory committee, comparable to the committee which established the program in 1925, be established to guide the Surgeon General in program administration. Consequently, we propose no immediate change in our method for conducting this Workshop, but we will expect to have formal proposals which can be submitted to the States at the next series of regional meetings. PHS central office staff will be prepared to interpret and explain our proposals at that time.

PROGRAM NAME

We feel that it would be helpful if a decision could be reached on a uniform name for our shellfish sanitation activity. Informally, we have used the title "Cooperative State-PHS-Industry Program for the Certification of Interstate Shellfish Shippers." This title, although descriptive, is a nuisance in any written material. Consequently, the program's name is frequently abbreviated, incorrectly, to "Shellfish Certification Program" or "Cooperative Program for the Certification of Interstate Shellfish Shippers." More recently, we have tended to use the name "National Shellfish Sanitation Program" feeling that the advantages of brevity outweigh those of a completely descriptive name. Again, we would like to have the views of the Workshop on this proposal.

PUBLICATION OF PLANT SANITATION RATINGS

A proposal has been made that the semi-monthly list of State certified shippers carry the most recent plant sanitation ratings. Proponents of this idea, largely industry, believe this would focus attention on the poorer plants and that resultant economic pressures would promote uniformity within the industry. This suggestion apparently reflects their feelings that plant inspection programs are not uniform and that some plants are substandard. While we acknowledge that variations do exist between States and Regions, we do not believe they are significant. Thus, we question if the gains from this suggestion would be adequate compensation for the many additional inspections or for the large amount of paper work needed for continual revisions of the shippers list. Instead, we feel that our efforts should be directed toward better standardization of inspection procedures both within the Public Health Service and the States. We also believe there would be some severe disadvantages in publication of shipper ratings. Buyers might conclude that a plant rating difference of one or two points would be significant whereas this is not the case. We cannot recommend that the Workshop endorse the proposal that plant sanitation ratings be published, but we feel that we are obligated to bring the proposal before the Workshop.

FINANCING STATE PROGRAMS

We have been greatly concerned with the financial problems which we have observed in the States' shellfish sanitation programs and believe that this is probably our greatest single problem. Information which our regional consultants have been able to obtain from the State agencies, and which reflects their knowledge of program needs, suggests an increase of almost two million dollars a year in State expenditures in necessary if the States are to meet current responsibilities. It is most probable that these technical problems will continue to increase and even greater financial support will be necessary in the years ahead to keep even with the problem. The State programs are, of course, the real foundation of this National program. If they cannot all be maintained, then the entire structure is endangered.

These problems are typical of those which might be encountered in any situation in which a resource of fixed size is subjected to increased pressures. There are only a limited number of acres of coastline! As pressures increase for multiple use of these areas, the State agencies are faced with ever increasing problems of making effective evaluations of areas and of policing these areas of unsatisfactory quality. While depuration, and perhaps other parallel devices, may provide some relief we do not feel that substantial economies can be effected and that adequate financial support must be obtained for the State programs.

The shellfish industry and the Conference of State Sanitary Engineers have both recognized this problem and have endorsed the concept of Federal legislation which would provide supplemental funds for these activities. The Association of State and Territorial Health Officers at their annual meeting two years ago also raised the questions of use of Federal grant funds. We have no specific progress to report in this area nor do we have any suggestions, but are convinced that this is a most significant administrative problem which must be in some way resolved. This is perhaps an area in which advice of the senior level advisory committee would be most helpful.

INTERIM DECISIONS

On several occasions in recent years we have been faced with situations not covered by the manual, but required a decision on a course of action; e.g., should the Ciguatera-like toxins of the Gulf Coast be treated in the same administrative manner as paralytic shellfish poison. It has been our practice to consult with one of the senior members of the Conference of State Sanitary Engineers, usually the Chairman of their Shellfish Committee, and with the Executive Secretary of the Oyster Institute of North America prior to making any decisions in such situations. (Internal PHS and other Federal agency clearances are, of course, obtained as required.) This procedure has worked reasonably well from our standpoint and will be continued unless the Workshop has other specific suggestions. This is an area in which the Executive Committee, functioning within the broad framework of a senior advisory committee, could be very helpful.

THE STATE PLAN

The current system for evaluation and endorsement of State shellfish programs by the Public Health Service is essentially retrospective. Under the existing program the Service makes annual reviews on a continuing basis. If it is found that a State program is ineffective, steps are taken to terminate endorsement of the State's efforts. Such an approach, which places emphasis on cure rather than prevention, is diametrically opposed to most public health thinking. Thus, we feel that another evolutionary change should be initiated in the National Shellfish Sanitation Program--prior PHS evaluation of the "State Plan" as a prerequisite for State participation in the National program.

Specifically, each State would be expected to submit to the Public Health Service their plan, for the next fiscal period, for carrying out their responsibilities under the National program. If a critical review of this plan by Public Health Service staff disclosed that the plan was such that the State would be unlikely to be able to carry on a satisfactory program, the Service would advise the State. The State would then have three courses of action: (1) a technical appeal based on the State's contention that the plan would, in fact, be effective; (2) assignment of additional resources or technical re-structuring to make the plan effective in terms of the cooperative program goals (i.e., a 70% compliance rating as outlined in Part III of our operating manual); or (3) non-participation in the program.

We feel very strongly that this positive approach, as contrasted with the retrospective study, would strengthen the program and improve the consumer protection confidence factors, would minimize friction between the State agencies, the industry and the Public Health Service, and would be an effective method for focusing attention on State agency budget and staffing problems.

To explore the pitfalls in this proposal PHS proposes development of a tentative protocol for the review of State plans, trial use with one or two of the interested States, discussions at the several State meetings, and, finally, open discussion at the next Shellfish Sanitation Workshop.

THE CONSUMERS INTEREST

In recent years there has been a growing awareness of the responsibility of government in protecting the interest of the consumer. I think we all realize that in our present complex society this is necessary as the consumer is no longer able to obtain the knowledge needed to enable him to act in his own behalf. This concept is just as valid in our shellfish sanitation activities as with other foods, drugs or other consumer products. In general, the consumer expects that the official agencies will do whatever is necessary to assure that the product as it reaches him will be safe, wholesome and properly labeled and identified.

We in the shellfish sanitation program have, for almost 40 years, identified the consumer and his interests as the motivating force behind our efforts. The shellfish industry is also constantly aware of the presence--or at unfortunate times the absence--of the consumer. Despite our acknowledged interest in the "consumer" we have never really sought his advice in the planning or carrying out of the National program. This may not be entirely true at the State levels although I am not personally acquainted with any of the State programs in which consumer groups have specific representation. Perhaps it is now time that we investigate how we can enlist the support--and obtain the advice and council--of some of these groups who have a specific interest in this product.

Unless the Workshop has strong views to the contrary we in the PHS intend to consult with the Inter-Council Subcommittee on Food Protection and if necessary the President's Committee on Consumer Interests to determine if such a course of action is feasible. Some of the States might also wish to consider a similar course of action at the State level.

There are, I am certain, other administrative and management decisions with which we should be concerned. However, we feel that the foregoing represent the more apparent problems. If we can decide on suitable courses of action on these, I feel that substantial progress will have been made in strengthening our National Shellfish Sanitation Program and that we shall be better prepared and equipped to meet future problems.

APPENDIX O

PUBLIC HEALTH SERVICE REPORT TO JOINT COMMITTEE ON MARINE FOOD SANITATION (APHA-CSSE) OF THE CONFERENCE OF STATE SANITARY ENGINEERS ON EVALUATION OF NEED FOR COOPERATIVE CERTIFICATION PROGRAM FOR SCALLOPS AND CRABMEAT

By

Leroy S. Houser
Shellfish Sanitation Branch
Public Health Service

(The assistance of Mr. Mario Boschetti, Sanitary Biologist, Massachusetts Department of Public Health, in the preparation of this report, is gratefully acknowledged.)

GENERAL

At the 1962 meeting of the Conference of State Sanitary Engineers, the Joint Committee on Marine Food Sanitation requested the Public Health Service to evaluate the need for cooperative certification programs for scallops and crabmeat. In conformance with this request, the Shellfish Sanitation Branch asked each of our Regional Offices to contact the coastal States, investigate and discuss their present sanitation programs on scallops and crabmeat, and seek the views of the State as to whether they felt a National certification program for these products was needed or warranted.

In April 1963, in discussing the progress made in gathering the necessary information with Mr. Mario Boschetti, it was discovered that "shrimp" was included in Charge No. 3, along with scallops and crabmeat, of the Charges which Mr. Boschetti had available. It should be noted that "shrimp" is not included in the Charges on page 57 of the published 1962 "Report of the Joint Committee on Marine Food Sanitation of the Conference of State Sanitary Engineers." Nevertheless, the Shellfish Sanitation Branch attempted, through a questionnaire mailed out by Mr. Boschetti, to obtain source information on shrimp for the deliberations of the Joint Committee on Marine Food Sanitation at its 1963 meeting. However, many of the States in replying to Mr. Boschetti's questionnaire indicated they had previously discussed the matter with Public Health Service consultants; consequently, little information was provided on the specific subject of "shrimp." A letter from Mr. John E. Trygg to Mr. Boschetti, dated May 31, 1963, indicated that it was his belief that it was not intended that "shrimp" be included, but that he could see no reason why such information as was obtained might be included as a matter of interest to the consuming, as well as the producing States. Since the only information obtained on "shrimp" is that Alaska, Alabama, California, Flordia, Massachusetts, Mississippi and North Carolina are the largest producing States and that each has either specific laws and regulations or control the product through their general food and drug laws, no adequate writeup could be prepared. However, the information on scallops and crabmeat is somewhat more detailed and it is believed the Committee can reach a decision on these two products.

CRABMEAT

Limited information was obtained from 24 coastal States as to whether they had any crabmeat industry, the type of sanitation programs currently being operated, and whether there was need for a National crabmeat sanitation program. The States from whom information was solicited by our Regional Offices are listed on the following page:

Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Hawaii
Louisiana
Maine
Massachusetts
Mississippi
Maryland
New Hampshire
New Jersey
New York
North Carolina
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Virginia
Washington

Of the 24 States submitting limited information, 8 had no crabmeat plants and no specific sanitary laws and regulations relative to crabmeat. It is assumed they controlled imports through their general food laws. Five States had plants, but no specific law or regulation applicable to crabmeat. These were California, Oregon, Maine, South Carolina and Texas, all of whom were providing sanitary supervision through their general sanitary food laws. This leaves 11 States with specific laws and/or regulations covering the sanitary control of crab picking plants, all of which have crabmeat processing establishments. These 11 States are Alabama, Alaska, Florida, Georgia, Louisiana, Massachusetts, Maryland, Mississippi, North Carolina, Virginia, and Washington. There are approximately 268 crabmeat plants in the U.S., with 60 being located in Alaska.

Only Florida, Maryland, and Virginia, had specific bacteriological standards for crabmeat. As a matter of interest these standards are reproduced below:

State		
Florida (crustacea standards)	(a)	Escherichia coli MPN less than 50 per 100 grams and coliform MPN less than 10,000 per 100 grams. (Selection of methods used will be at the discretion of the board.)
	(b)	Standard plate count of less than 100,000 per 100 grams.
	(c)	Enterotoxic staphylococcus count to be less than 100 per 100 grams.
Maryland (fresh crabmeat)	4.01	Crabmeat showing 50 Escherichia coli MPN per 100 grams shall be subject to seizure and condemnation.
	4.02	Routine crabmeat samples showing any Escherichia coli MPN per 100 grams and/or a total bacteria count in excess of 100,000 per gram shall be evident of insanitary plant conditions.
(pasteurized crabmeat)	5.05	A. Escherichia coli. There shall be no Escherichia coli present in pasteurized crabmeat.
		B. Total bacteria count. The standard plate count shall not exceed 25,000 bacteria per gram of pasteurized crabmeat.

	C. Seizure and condemnation. The presence of E. coli, or a total bacteria count in excess of 25,000 per gram, shall be construed as adulterous rendering the product unfit for human consumption and shall constitute grounds for seizure and condemnation.
Virginia (Interim standards)	Coliform MPN should not exceed 4,900 per 100 grams; standard plate count should not exceed 100,000 per gram; E. coli MPN should not exceed 50 per 100 grams.

Three States, Georgia, South Carolina, and Mississippi, indicated they used New York City and Maryland bacteriological standards. California indicated they had a reciprocal agreement with New York City on crabmeat shipments, but had not shipped any meat for two years. As a matter of interest, New York City bacteriological standards applies to all imports, and are presented below:

Total plate count	100,000 per gram
Enterococcus count	1,000 " "
Staphylococcus aureus count	100 " "
Coliform count	100 " "

Three States, Florida, Georgia, and South Carolina, indicated that they published a certified list of crabmeat dealers by which means New York City was kept advised of State certified plants.

Maryland was the only State which had time and temperature specifications for pasteurization of crabmeat. These are quoted below:

> The minimum pasteurization specifications shall be the holding of the internal temperature of the can of crabmeat at 170°F. for at least one minute. This may be accomplished in approved equipment by means of a process providing the thermal equivalent of continually retaining 307x409 (No. 2) cans of crabmeat in a circulating water bath at a temperature of 175°F. for 115 minutes or 211x400 (No. 1) cans at 175°F. for 90 minutes.

When querried as to whether the State would support a certification program on crabmeat, only 7 States indicated they would support such a program, unequivocally. These were Alabama, South Carolina, Alaska, Oregon, Massachusetts, Louisiana and Florida. Three States (Hawaii, Georgia, and Mississippi) indicated "yes, if needed," but further indicated it was not needed at the present time. Three other States indicated they "probably" would support a certification program. One State indicated they would need a meeting with their crabmeat industry to determine an answer to the question. Another State indicated they would have no objection to such a program. One State said "no," unequivocally. Another indicated a certification program on crabmeat was not needed for their State. The remaining 9 States either did not answer the question or indicated they were in favor of a certification program only for scallops.

None of the 24 States indicated any major problem existed with regard to imports or exports. Several indicated that at one time or another they had minor difficulties with exports to New York City, but that these difficulties had been resolved without undue hardship.

The principal crabmeat producing States are Alaska, Florida, Maryland, Virginia, Washington, Oregon, North Carolina, and California. Each of the above States have 10 or more crabmeat picking plants, while Georgia, Mississippi, South Carolina, Alabama, Massachusetts, Louisiana, and Texas, have currently less than 10 plants.

CONCLUSIONS AND RECOMMENDATIONS

In view of the above, limited information, there does not appear to be sufficient public health justification or necessity for operation of a voluntary cooperative program on certification of crabmeat shipped interstate at this time. The States which are major shippers appear to have adequate laws or regulations and adequate sanitation programs covering the product. Since only 7 States indicated unequivocal support for such a program, it is doubtful that a great deal of sustained State support for certification could be realized. Due to the lack of specific public health problems delineated on crabmeat, it is anticipated that the Public Health Service would have difficulty in justifying such a program and that the State would have similar problems in securing funds for operation of the program from their State legislatures.

It is therefore recommended that the Conference of State Sanitary Engineers table the subject of a certification program for crabmeat. However, the Shellfish Sanitation Branch is not adverse to preparing Sanitary Recommendations for Crabmeat Picking Plants if the Joint Committee on Marine Foods feels it would be desirable to have such uniform standards available for voluntary adoption as the States may see fit. This latter suggestion may be worthy of consideration by the Joint Committee as several States have active programs and the need for uniformity in our opinion is evident; particularly in regard to pasteurization and bacteriological standards.

SCALLOPS

Limited information was obtained from 24 coastal States as to what type of sanitation program they had for the harvesting, processing, and handling of scallops. Their views were solicited as to whether they felt the need for a National sanitation program and whether they would cooperate in such a program if it were established. The States from whom information was obtained are listed below:

Alabama
Alaska
California
Connecticut
Delaware
Florida
Georgia
Hawaii
Louisiana
Maine
Massachusetts
Mississippi
Maryland
New Hampshire
New Jersey
New York
North Carolina
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Virginia
Washington

Of the above 24 States, 16 had no specific sanitation laws or regulations directed toward the handling or processing of scallops (does not include conservation measures). Five States included scallops in their definition of "shellfish"; hence, were deemed to have specific regulations. One State, Massachusetts, had specific separate sanitary regulations covering the harvesting, shucking, and handling of both the bay scallop and the sea scallop.

The above is not intended to suggest that the 16 other States need comprehensive legislation on scallops. For example, of these 16 States, 12 reported that they had no scallop industry or scallop shucking plants; hence, they would not have need for sanitation regulations that the producing States would have. Some measure of control is extended over scallops; however, through the States pure food laws (examples, Maine Food Law and Oregon Pure Food Act) even though they may have little or no scallop industry.

The principal scallop producing States are Florida, Massachusetts, New Jersey, New York, and North Carolina. Of these, Massachusetts had specific regulations covering both bay and sea scallops while Florida, New Jersey, and New York include scallops in their definition of shellfish. North Carolina indicated that if scallops were included in a certification program virtually all of their 15 to 20 plants would require some kind of major reconstruction.

On the question as to whether the 24 States would support a certification program only 5 reported "yes," unequivocally. The remainder expressed doubts as to the need of such a program or indicated they would support it if the need could be demonstrated.

In regard to the question as to whether there were any problems in regard to importation of scallops from other States, only three States indicated any problems existed. These three States were among the five who indicated unequivocal support for a certification program and indicated they wanted the assurance a certification program could provide as to the sanitary quality of imports from other States.

CONCLUSIONS AND RECOMMENDATIONS

On the basis of the above, limited information, it does not appear necessary that a separate certification program for scallops is advisable or is necessary at this time to protect the health of the public. It should be borne in mind that the viscera of the scallop is discarded in the shucking process with only the meat or muscle being eaten, and that very few, if any, scallops are consumed raw. When it is considered that 4 of the 5 principal State producers of scallops have programs which are effective, it is unlikely that little concrete improvement could be gained from a separate or additional sanitation program for scallops.

A further question naturally arises as to whether scallops could not be included in the definition of "shellfish" as contained in the PHS Shellfish Sanitation Manual. It was included in the original 1925 Report of Committee on Sanitary Control of the Shellfish Industry, but was not included in the Manual requirements after 1937 probably because the viscera is discarded in the shucking process and the meat is not consumed raw. Five States include scallops in their definition of shellfish at the present time; hence, they would have no problem. This would probably leave Connecticut, Rhode Island, Maine, and North Carolina, with the problem of seeking authority from their legislation to include scallops in the current shellfish certification program.

From the viewpoint of the Public Health Service, we would have no objection to including scallops again in our definition of shellfish. Before doing so, however, we would have to discuss it at regional meetings with the States and present it to the National Shellfish Sanitation Workshop for ratification by the States and the industry as we do with all changes in the recommended Manual. In so doing we probably would want to waive the present Manual requirements that a separate shucking room apart from the packing room be provided and the coliform MPN requirements for growing water be waived.

It would therefore be our suggestion to the Conference of State Sanitary Engineers that they recommend the PHS take up the matter of including scallops in the present Shellfish Sanitation Voluntary Cooperative Program for the Certification of Interstate Shellfish Shippers with the individual States and with the National Shellfish Sanitation Workshop. It would thus be understood that if the National Shellfish Sanitation Workshop agreed with or endorsed the proposal, the PHS Manual would be changed to include scallops, and if the Workshop did not endorse the proposal, the matter would then be dropped.

APPENDIX P

REGULATORY PROBLEMS ON NON-CERTIFIED IMPORTS OF SHELLFISH

By

C. S. Brinsfield
Division of Food Control
Maryland State Department of Health
Baltimore, Maryland

It has been approximately two and one-half years since I walked into Eugene T. Jensen's office and was asked by Mr. Jensen what would Maryland do if non-certified oysters imported into this country would be shipped into our State. My reply was the question, are they raw or cooked? He indicated they were raw and frozen into a cylindrical form. My answer to his statement was, "we will seize them." His reply was to the effect we had better get prepared because some were slated to be shipped into Maryland.

After being briefed on the import story, I concluded it was the duty of the United States Public Health Service to control the importation of raw frozen oysters and asked what is the Public Health Service going to do about them. I was shocked when Mr. Jensen informed me that, although they would like to keep them out, they had no control over imported shellfish that were not entering under the U.S.P.H.S. certification program. I learned it was the duty of the Food and Drug Administration to sample imported oysters unless they came in under the U.S.P.H.S. certification program.

My next visit was to the Food and Drug Administration and they informed me their laws only provided for an objective examination. I was told several seizures had been made at the Texas border, but some shipments had passed the objective examination. Food and Drug records showed they sampled approximately 1% of the foods entering the United States.

It seemed strange to me that raw frozen oysters could be imported into the United States without any knowledge of the condition of the waters in which they were grown, how they were handled during harvesting, packing and shipment to market, yet all raw frozen oysters grown, harvested, packed in the United States and transported for interstate sale had to be certified under the U.S.P.H.S. shellfish program. The only consolation I could get out of either the PHS or the FDA was--they were going to get together for a conference to see what could be done about the situation.

When I received no help from Federal authorities in keeping these imports out, my next step was to go to that segment of industry which had planned to import the oysters. After a series of conferences where all aspects of the situation were weighed, I was informed any oysters that were not good enough for sale in Maryland, the company in question would consider them as unfit for sale in any of their stores would do likewise. However, this was no guarantee that all chain stores would do likewise. I mention this incident to bring out one important point. If regulatory agencies will cooperate closely with all segments of the food industry in keeping them informed of the quality of food they are processing and or selling, you will find the vast majority will reciprocate whether it means detaining or seizing some of their foods or receiving the go ahead signal for sale. It is my contention, the closer you cooperate with industry as a whole, the higher will be the quality of products reaching the consuming public.

Now, lets get back to the non-certified frozen oysters. The word soon got out that Maryland would seize any imported shellfish that were not under PHS certification. Our next step was to call States adjoining Maryland to warn them of the situation. This was done and through the grapevine we learned of a shipment of oysters destined for an adjoining State. It arrived, but before seizure could be made, it was transhipped to another State. We informed the regulatory authorities in that State and the frozen oysters were detained.

Here again, I wish to mention cooperation. This time it was between States. Regardless of what phase of work regulatory agencies are carrying out, there must be close cooperation between your counter-parts in surrounding States if you are going to adequately protect the consuming public and the segment of industry that is operating on a legitimate basis.

I want to raise another question concerning the ability of Food and Drug or Public Health Service to keep out oysters. All of you know there is a standard for oysters. Suppose someone added monosodium glutamate and other seasoning to oysters and tried to get them into our country by calling them oyster stew mixtures. Could either of these agencies use our regular oyster standards to evaluate the product? I doubt it because technically they would not be oysters, but a product containing oysters. They would have to come under Food and Drugs objective examination, but that does not help us if we want them evaluated according to the PHS shellfish certification program.

It is imperative for a State receiving foods such as shellfish to possess information relative to the growing area, harvesting practices, in-plant protocol inclusive of sanitation, in-transit handling, etc. Such information may be of great assistance to State regulatory officials in determining the wholesomeness of the product and its possible effect on the public health.

Laboratory analyses at the point of entry or destination may provide some insight regarding the quality of the shellfish, but at times such information may be of little or no use and in some cases can actually be misleading without background knowledge of the product. While microbial indices have been of great help to health officials concerned with the shellfish industry, proponents of bacterial indices will readily agree that the results obtained may not detect health hazards of viral or toxic origin. It is well known that the production of enterotoxin in certain foods by toxigenic strains of staphylococci would more than likely be missed by ordinary laboratory examinations, since special and time-consuming procedures would be required to establish the presence or absence of toxin. This toxin, you will recall, can withstand boiling as well as freezing so that low microbial indices give no indication of this potential public health hazard in a given product. Likewise, most if not all food outbreaks of infectious hepatitis have been traced more by epidemiological means rather than by actual isolation of the hepatitis virus from the suspected shellfish.

Except in purposely fermented foods such as cheese, pickles, wines, etc., the changes occurring from the multiplication of micro-organisms almost always adversely affects the quality of a food. Enzymes produced as a result of microbial growth may trigger chemical reactions in foods such as shellfish and cause these reactions to occur many thousandfold times faster. Reactions such as these are mainly responsible for such things as undesirable flavors, odors, shorter shelf-life, etc. The practice of good sanitation depends upon holding microbial organisms and their growth to a minimum to prevent these undesirable reactions. It is important to remember that processes destroying micro-organisms do not necessarily destroy their enzymes. Enzymes may survive heat and other processes destructive to bacteria and may be active in wide temperature ranges - even at 32°F. or below.

Food examination at the receiving State is one more link in the chain of evaluating a food for quality control and protection to the consuming public. Knowing that shellfish evaluation through the Public Health Service shellfish program is the most practical method of assuring safe products for the consuming public is one thing, but how to accomplish it under the present circumstances is something else.

I am sure there is more than one way to control the situation, but I shall only discuss the one Maryland has used.

Through the cooperation of our State legislature, the following law was passed last winter:

SHELLFISH AND FOOD PRODUCTS

228A.

(a) The State Department of Health shall prohibit the importation into the State of shellfish from sources that have not been certified for interstate shipment through the Public Health Service. This prohibition shall not extend to shellstock imported into the State for replanting under the direction of the Department of Tidewater Fisheries.

(b) The State Department of Health shall prohibit the importation into the State all food products containing shellfish and/or portions of shellfish unless the shellfish and/or portions of shellfish are from sources which have been certified for interstate shipment through the Public Health Service. All processors of food products containing imported shellfish and/or shellfish portions must keep on file proof that the shellfish and/or shellfish portions are from sources certified through the Public Health Service and shall forward to the State Department of Health this proof if and when it is requested by the Department.

(c) The State Board of Health and Mental Hygiene may delegate to the Commissioner of the State Department of Health authority to detain shipments of imported shellfish and food products containing shellfish and/or portions of shellfish from questionable or uncertified sources for such action as may be necessary.

(d) The State Department of Health may condemn and destroy shellfish and food products containing shellfish and/or shellfish portions imported into the State from uncertified sources.

(e) Any person who handles, receives or possesses uncertified shellfish and food products containing uncertified shellfish and/or shellfish portions in violation of this section shall be subject to a fine of not more than $500.00 for each offense. Each and every such violation shall constitute a separate offense.

SECTION 2. And be it further enacted, that this Act shall take effect June 1, 1964.

You will note that the Maryland law covers all types of shellfish rather than just the raw and frozen ones. This was done to include smoked, and cooked shellfish or portions of shellfish used in food products. This should substantially eliminate the chances of illness due to viral infections and some types of toxins that survive both high temperatures and freezing. I suggest that consideration be given to include all edible types of shellfish and/or portions of shellfish under the PHS program instead of only raw and frozen regardless of whether they are mixed with seasoning or other food ingredients.

Although the title of my paper is Regulatory Problems on Non-certified Imports of Shellfish, the overall theme of it is protecting the health of the consuming public. With this thought in mind, I shall briefly discuss another method of eating shellfish that is not only rapidly increasing in popularity, but does not have the partial built in protection that cooked shellfish possess. It is the sale of raw shellfish on the half-shell.

The Federal minimum wage law has forced many operators of shellfish and crab plants to sell as much of their seafood as possible without picking the crabs or shucking the shellfish. Picking crabs and shucking shellfish is becoming a lost art as the older people who learned the trade when they were young, are retiring and accepting social security. Today the operators of the seafood plants cannot afford to have the younger generation master the art of picking and shucking at the Federal minimum of $1.15 per hour.

During the last year's oyster season we made a survey in Maryland to determine conditions under which the so-called "oyster roasts" were operated.

The vast majority of the shellfish were served on the half-shell raw. Conditions under which the shellfish were handled varied somewhat. However, in our opinion, there was a need for some educational work on handling practices which could benefit the consuming public and the oyster industry. Accordingly, we met with a committee from the shellfish industry and drew up the following statement, which is being printed on a bright yellow 8" x 5" card which will be attached to each barrel, box, basket or bag of shellfish sold for raw bar consumption.

The card states "These shellfish have been harvested and packed under the high standards of the Maryland State Department of Health and the U.S. Public Health Service. To maintain high quality, fresh flavor and sanitary conditions, it is urged that--

1. Shellfish be kept below 45°F. but not in direct contact with ice.

2. Shuckers wear clean outer clothing including a cap or paper hat. They should wash their hands before handling shellfish, using soap and warm water.

3. Shuckers with a cold, sore throat, infected cuts on their hands, or other illness should not handle shellfish.

4. Shellfish should be protected from dirt - such as used water, floor cleaning spatter and leakage from above the container.

Shellfish are food - protect them like any other food!

After using this card for the 1964-65 season, I expect we will be able to improve the language or possibly make the card with a hole as in tags so it may be tied on bags of shellfish as well as stapled to barrels, baskets, etc.

I doubt whether there is any one "sure fire" method of educating the people who work with shellfish from the time they are harvested until they are ready to be eaten as to how they should be handled and why they should be handled as suggested, but each shellfish producing State in this country should rededicate itself to a program of education that will produce the best results in their respective sections.

APPENDIX Q

SHELLFISH IMPORTS

By

William A. Felsing, Jr.
Shellfish Sanitation Branch
Public Health Service
San Francisco, California

The sanitary control of fresh and frozen shellfish imports into this country has been a topic of great interest since the mid 1920's; however, discussions at this time are particularly relevant in view of the unparalleled growth occurring in world fisheries, and the increasing interest of foreign countries in exporting their fishery products to the United States.

The sea is one of man's greatest natural storehouses of food. It is estimated that at the present time only 10% of this vast resource is being utilized for the benefit of man. Explosive population growth throughout the world has, however, awakened the world to the importance of this resource; consequently, many countries today are actively pursuing the development of these fishery resources. This is particularly true of Central and South America and of the new emerging African States. These countries are not only interested in developing an important source of food for their increasing populace, but are looking toward these commodities to bolster their national economies through international trade.

Economically, the most valuable fishery products entering international trade are fresh, frozen, and canned fish and shellfish; however, at the present, these products represent but a small fraction of the total world trade. In 1962, for example, imported fresh and frozen oysters and clams represented less than 0.1% of the total fishery imports of this country. Recognizing the recent development in foreign fisheries the past several years, there is no reason to believe that this situation will continue to prevail. In fact, increasing expressions of interest of foreign countries desiring to market their bivalve shellfish in the United States would tend to indicate otherwise.

Although imported fresh and frozen oysters and clams currently represent but a small fraction of fishery products entering the United States, their associated potential public health significance is far greater than statistical figures would tend to indicate. Fundamentally this is due to the unusual physiological ability of these molluscs to accumulate and retain microorganisms, including those pathogenic in nature, toxic chemicals, and deadly marine neurotoxins from their marine environment, and the relative ease which these harmful pollutants may be passed on to the consumer.

Concern over the sanitary quality of fresh and frozen shellfish imported into this country is not a new and emerging problem, but an old and continuing one. Ever since the inception of the Cooperative Program for the Certification of Interstate Shellfish Shippers some forty-odd years ago, there has been deep concern over the potential public health hazards associated with imported shellfish. This concern stems directly from the basic tenet upon which the Cooperative Program was founded and continues to be governed today, the singular concept of "control of source."

It has long been recognized and agreed by health and food officials knowledgeable in sanitary production of shellfish that the only assured means of providing complete consumer protection is by attendant control of all phases of shellfish production. Accordingly, the Cooperative Program has emphasized the sanitary evaluation of shellfish growing areas, prevention of harvesting from areas of unsatisfactory quality, surveillance of areas of natural toxicity with prevention of harvesting when required, and close sanitary supervision of all aspects of harvesting, shucking, packing, and shipment to receiving areas. It is the concensus of State and Federal agencies, and the shellfish industry, that such a control program is essential to assure safe shellfish for the consuming public, regardless of foreign or domestically produced.

Currently, the only means foreign shellfish shipments may be denied entry into the United States is through the provisions of the Federal Food, Drug, and Cosmetic Act. Under this Act, inspections of source are not provided for, only objective examinations of shipments upon their arrival at port of entry. If through such examinations the Food and Drug Administration finds the shipment to be insanitary, adulterated, or mislabeled, their entry can be denied. However, in the absence of such evidence, entry must ordinarily be permitted. While objective examinations are of value, to be sure, they do not and cannot, under present technology, provide complete evidence as to the sanitary conditions under which the shellfish were produced. Accordingly, such examinations cannot be relied upon as a total substitute for the "control-of-source" sanitary controls required by the Cooperative Program. The Public Health Service cannot, therefore, recommend the sale of fresh or frozen foreign shellfish produced outside the provisions of the Cooperative Program, although such shellfish may have been legally admitted into this country. Consequently, the majority of the States will not permit the sale of such shellfish. Such State action is presently the only truly effective means of controlling importation of non-certified foreign shellfish.

Sanitary control of shellfish imported from Canada was successfully met early in the formation of the Cooperative Program through development of a bilateral shellfish sanitation agreement. Under this agreement, which was formalized in 1948 Canada agreed to use the same sanitary standards and control practices as utilized in the United States. Canadian dealers shipping fresh or frozen shellfish into this country are certified to the Public Health Service by the Canadian Department of National Health and Welfare as complying with the sanitary standards of the Cooperative Program. Canadian shippers are accordingly listed together with U. S. shippers on the Public Health Service's bi-monthly list of certified interstate shellfish shippers. Under the provisions of the U. S. - Canadian Agreement, there has been a continuing exchange of both administrative and technical information between the two National Governments through reciprocal inspections and joint shellfish sanitary surveys. Past experience has shown this agreement with Canada to be highly successful.

The problems relating to the sanitary control of imported fresh or frozen shellfish from countries other than Canada were discussed in some length at the Fourth National Shellfish Sanitation Workshop in 1961. As a consequence of these discussions, a statement of position regarding the sanitary control of such non-certified imports was adopted by the Workshop participants. This position statement recommended Federal action to provide an extension of the Certification Program to foreign sources of shellfish other than Canada in addition to continuing to remind State agencies of their public responsibilities in preventing the sale of non-certified shellfish.

Following the 1961 National Workshop, a series of meetings between representatives of the Public Health Service, Food and Drug Administration, and Department of State, were held to discuss the administrative problems related to the sanitary control of fresh and frozen shellfish imported from countries other than Canada. It was tentatively concluded that the U. S. - Canadian Shellfish Sanitation Agreement had established a principle, and that there were no apparent obstacles, other than administrative, in extending similar agreements to other countries. In consideration of this decision, and at the request of the Japanese Government, the Public Health Service and Department of State began negotiations with the Government of Japan relative to the development of a Shellfish Sanitation Agreement between the two countries similar in nature to the U. S. - Canadian Agreement. In the Fall of 1962, after lengthy negotiations and on-site reviews, an agreement was signed between the United States and Japan which provided for PHS recognition of the Japanese Shellfish Sanitation Control Program. Since that time, a single shellfish shipper in Hiroshima Prefecture has been certified to the Public Health Service by the Japanese Ministry of Health and Welfare as complying with the sanitary provisions of the Cooperative Program. Accordingly, this Japanese shipper has been included on the PHS list of certified shippers, together with U. S. and Canadian shippers. Each year since the conclusion of the Agreement, the Public Health Service has, at the expense of the Japanese Government, assigned a sanitary engineer to Japan to jointly review the Hiroshima Prefecture Shellfish Sanitation Control Program with representatives of the Japanese Ministry of Health and Welfare. These reviews have indicated the Japanese control program to be in high compliance with the provisions of the Cooperative Program.

Official interest from foreign governments in exporting fresh and frozen shucked and shelled molluscs to the United States has increased noticeably within the past few years. In response to this interest, the Public Health Service has, on separate occasions, participated in a series of discussions with representatives of the Department of State, the Republic of South Korea, France, and Venezuela, directed toward exploring the possibilities of developing sanitation agreements similar to those currently held with Canada and Japan. At this time, there is no way of predicting the eventual outcome of these negotiations; however, the matter is under active discussion at the present time.

The Public Health Service has recently been advised that the Government of Mexico will soon indicate its official interest in exporting shellfish to this country under an agreement which will permit the marketing of their products under the terms of the Certification Program. It is reported that the Mexican Government has launched a broad program for large-scale expansion of their national fisheries. Mexican fisheries are currently heavily dependent upon shrimp export and every effort is being made to broaden the exploitation of other fishery resources. Expansion plans call for commercial utilization of oysters harvested from the States of Tabasco and Campeche and of the vast Pismo clam resources existing along the ocean beaches of Baja, California. It has been reported that Mexican interests have recently been attempting to interest United States chowder canners in large quantities of Pismo clams to be harvested by modern clam dredges.

In addition to official interest from the countries mentioned, the shellfish industries of Australia, New Zealand, American Samoa, and Iceland, have recently renewed interest in increasing the sale of their shellfish products here in the United States. As exploitation of the world's fisheries increases, it can be expected that increasing numbers of other countries will become desirous of shipping their shellfish products to markets here in this country. Countries exporting fresh and frozen oysters and clams to the United States during the period from 1960-1964, are summarized in Tables 1 and 2.

The present system of extending the provisions of the Cooperative Shellfish Program to foreign countries by means of shellfish sanitation agreements, although sound in principle, cannot be considered as an administratively satisfactory solution as the basic problem remains unresolved. Countries lacking agreements can still export their fresh or frozen shellfish to this country, providing that suitable markets exist, and such shipments are able to pass objective examinations at port of entry.

Enactment of Federal legislation for control of the public health aspects of noncertified shellfish imports would appear to offer the most promising solution to this problem. However, bills introduced at the second and first sessions of the 86th and 87th Congress respectively, were not passed although interests in this field continues. The Oyster Institute of North America, the Conference of State Sanitary Engineers, and the Association of State and Territorial Health Officers, have all endorsed the principle of Federal legislation as providing a mechanism for controlling the sanitary quality of imported shellfish. Possible legislative action is presently under serious consideration by the Public Health Service; however, the Service and Department of Health, Education, and Welfare, have not, as yet, taken a formal position in this regard. It is difficult to predict what final action will be taken.

In the absence of specific shellfish legislation prohibiting the entry of shellfish produced under unknown sanitary conditions, or of some other equally effective control measure, the Public Health Service will, in accordance with the recommendations of the 1961 Workshop, continue to consider the extension of the sanitary control provisions of the Cooperative Program to other countries wherever technically possible, and with due regard to the limitations of available fiscal and personnel resources. State and local health agencies must necessarily retain the responsibility of permitting or denying the sale of shellfish imported from those countries not extended shellfish sanitation agreements.

FRESH OR FROZEN SHELLFISH IMPORTS - 1960-1964

Table I: CLAMS

			Amount in Pounds		
Country of Origin	1960	1961	1962	1963	1964*
Canada	337,398	283,656	255,555	295,593	117,110
France	-	270	-	160	-
Hong Kong	133	-	190	-	500
Italy	2,756	-	-	-	-
Japan	443,332	529,429	358,083	150,389	3,228
Mexico	190,974	299,356	26,172	22,620	67,045
Portugal	4,070	6,565	-	-	-
Venezuela	-	-	1,129	-	-
Yearly Total:	978,663	1,119,276	641,129	468,762	187,883

*First six months only.

Table II: OYSTERS

			Amounts in Pounds		
Country of Origin	1960	1961	1962	1963	1964*
Australia	-	-	-	-	8,400
Canada	500	1,200	20,920	854,667	515,164
Denmark	-	-	-	324	105
Hong Kong	2,110	120	-	7,905	35,135
Japan	70,935	131,086	94,228	440,029	50,013
Korean	-	-	-	2,640	2,000
Mexico	11,466	-	23,480	70,547	35,536
Spain	-	-	-	3,850	-
Yearly Total:	85,011	132,406	138,628	1,379,962	646,353

*First six months only.

APPENDIX R

CONTROL OF SPORT HARVESTING AND INTRASTATE SALE

By

Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

Our discussions at this point in the Workshop digresses from the administration of the "Cooperative Program for the Certification of Interstate Shellfish Shippers." However, they do not depart from the concept of a National Shellfish Sanitation Program. We are concerned with the sanitation practices applicable to shellfish sold in intrastate commerce and the public health hazards associated with "sport harvesting" of shellfish. Although the Cooperative Program does not include sanitary control over sport harvesting or intrastate sale of shellfish, we cannot escape the facts that they have public health significance and that adverse publicity attributed to these practices has an impact on the commercial use and sale of shellfish in interstate commerce. Thus, the control agencies, the shellfish industry and the consumer all have an interest in these problems.

Under the National Shellfish Sanitation Program each State is expected to classify all areas which can be used for shellfish harvesting or culture on the basis of nationally recognized sanitary standards. These standards are described in Part I, "Sanitation of Shellfish Growing Areas" of the Manual, "Cooperative Program for the Certification of Interstate Shellfish Shippers." This position has been taken--I believe rightfully--on the premise that there is no practical method for assuring that shellfish, once harvested, will move in inter- or intrastate commerce. While this approach is applied to the sanitary classification of growing waters it has not always been practical for the States to identify to the public all areas in which shellfish are likely to be of unsatisfactory quality. To avoid any misinterpretations of this remark, however, I do want to emphasize that mose of the States have been able to apply their "interstate" identification program to most areas.

The situation with respect to sanitary standards is somewhat different. Many of the States issue both intra- and interstate permits. In some cases the sanitation standards for the intrastate shippers are substantially below those for the interstate shippers. This problem of uniform sanitary standards has been discussed many times in the past. In general, the States agree that sanitation standards for local dealers should be comparable with those applied to interstate shippers. However, they did not want to have these shippers included in the Cooperative Program, or to have the sanitation ratings for these shippers included in the annual PHS State ratings. The shellfish industry representatives --usually interstate shippers--on the other hand, see no reason why the local shippers, their competition in home areas, should receive preferential treatment.

The 1925 Advisory Committee on Shellfish Sanitation stressed the concept that control of shellfish was the responsibility of the State, but recognized the need for uniform standards. This principle has been followed by the Cooperative Program and ratings of intrastate shippers are not considered in the annual State evaluations. However, the most recent revisions of the Shellfish Manual recommends that intrastate shippers comply with the same sanitation standards as do the interstate (or international) shippers. The interim draft of Part III of the Manual also provided that a small deduction would be made from a State's program rating if intrastate standards were not substantially equivalent to those of the interstate standards; however, at the recommendations of several States this procedure is being dropped.

It seems to me that as health officials we have been inconsistent in our handling of this problem. On the one hand, we have said that all shellfish offered for sale in the United States should be of equivalent quality. At the same time some of the States, not all, have argued that this should not apply to the shellfish offered for sale to their own residents or visiting tourists. At times we have been engaged in great debates over State's rights in this area, and have ignored the relationship of this problem to that of national control.

In my opinion we have reached a point at which we should stop talking about this problem in terms of State-Federal relationships. Rather than bicker over the respective roles of the States and the Federal Government, I suggest that we recognize our responsibilities to the consumer--local resident or tourist--and that we agree to the principle that there will be one standard for all shellfish, interstate, intrastate or international, sold in the United States. Specifically, I suggest the following actions:

1. Reendorsement by the Workshop of the concept of a single sanitation standard for all shellfish;

2. That the Workshop request other interested groups, such as CSSE and ASTHO, to endorse the need for uniform standards;

3. That intrastate shippers not be considered in the PHS evaluation of State programs;

4. A joint PHS-State progress report should be submitted at the next Workshop relative to the progress made in eliminating dual standards.

SPORT HARVESTING OF SHELLFISH

The situation which prevails with respect to the so-called sport harvesting of shellfish is quite different from that dealing with intrastate shippers. The former is concerned with plant sanitation and therefore is of limited public health significance. "Sport harvesting" on the other hand may involve the harvest of toxic or contaminated shellfish and has appreciable public health significance.

There have been numerous instances in the past in which "sport or home use harvesting," and its associated problems of bootlegging, have caused small outbreaks of disease. In the past year there have been at least three more such incidents. Although these are local in nature, and presumably of no direct concern to the Cooperative Program or to interstate commerce interests, they are nevertheless costly in terms of adverse public relations for the shellfish industry and in terms of local disease transmission. In one case an individual harvested clams from a polluted area for use as bait. Instead he ate the clams, developed infectious hepatitis, and started a chain of events which resulted in 26 additional cases of infectious hepatitis among his neighbors and other contacts.

We do not know the exact extent to which the States now permit the harvest of shellfish for private use, but we do know the practice varies widely from State to State. In one State, for example, any citizen apparently has the right to harvest up to two bushels of oysters per day for his own use. He cannot legally sell these oysters. Yet one must ask if these shellfish might not find their way to the markets where they constitute a public health hazard and a potential danger to the legitimate shellfish industry.

The answer seems to us to be relatively simple. In practice it may be difficult for each of the States to take the necessary action to provide effective protection for all shellfish consumers. As with the case for interstate shippers, we think that there should be only a single standard for all shellfish and that there is no justification for the private citizen harvesting shellfish from areas known to be polluted or toxic. As a first step toward corrective action, we suggest the following action on the part of the Workshop:

1. Endorsement of the principle of a single sanitation standard for all shellfish sold or harvested in the United States;

2. Recommend that each State examine how it controls this problem and urge each coastal State to take necessary steps to prevent or discourage the harvesting of shellfish from contaminated or toxic areas; and

3. Request that PHS prepare a yearly report on the status of this problem and that the report be made available to interested organizations such as ASTHO, CSSE, ASMFC, etc., and the States.

It is probably premature to engage in any discussion of actions that can be taken by the States to control this situation. There are, however, five obvious steps which should be helpful:

1. Review of State laws with a view toward closing any loopholes which permit the harvesting of shellfish from areas closed to commercial harvester for sanitation reasons;
2. Require a harvesting permit for sport or home use;
3. Initiate an educational program directed toward shore residents, license holders and tourists on the hazards of use of shellfish from toxic or contaminated areas;
4. Maintain State programs which will provide adequate identification of areas containing toxic or contaminated shellfish; and
5. Endorse the proposal that PHS give increased attention to this problem in the National program by:
    - a. Making suitable recommendations in a State's program if it appears that poor control of sport harvesting would weaken the Cooperative Program; and
    - b. Submit a yearly evaluation of this problem to the State along with the annual program review.

In our opinion the present inadequate controls over "sport or home use harvesting" is a major weakness in our National control program. We believe that corrective action by the States is long overdue.

APPENDIX 5

BACTERIOLOGICAL CRITERIA FOR SHELLFISH GROWING AREAS REPORT ON COLLABORATIVE STUDY

By

William J. Beck
Northwest Shellfish Sanitation Laboratory
Public Health Service
Purdy, Washington

INTRODUCTION

Summary

Data presented by individuals at the 1961 National Shellfish Workshop (1961) included results of coliform and fecal coliform tests on shellfish growing waters throughout North America. The results of these studies have been combined into one report. In addition, supplemental research data from other areas in North America have been added. From these data certain recommendations regarding the fecal coliform test and standards for the fecal coliform MPN's in shellfish growing waters have been made.

Conclusions

From the data presented in the collaborative studies, plus that from other areas, the following recommendations have been made:

1. The fecal coliform test enumerated the domestic pollution potential in each area on a more consistent basis than the coliform test.

2. The fecal coliform test should be performed at an incubation temperature of 44.5 ± 0.2°C. (water bath) for a period of not more than 24 ± 2 hours. Where the 45.5°C. air incubator is utilized comparative tests with water bath tests should be made to determine comparable time of incubation.

3. In an approved shellfish growing area, a median fecal coliform MPN of 7.8 shall not be exceeded and not more than 10% of all samples tested shall exceed an MPN/100 ml. in excess of 33 (46 per 100 ml. where the 3-tube decimal dilution test is used).

STUDY AREAS INVOLVED

Various participants at the Shellfish Sanitation Workshop (1961) presented data from many regions in North America on fecal coliform organisms found in shellfish growing waters. A committee was formed to undertake the task of co-ordinating this wealth of material as well as subsequent research. From these studies recommendations were to be made. A final report on the significance of fecal coliform organisms in shellfish growing waters was to be presented at the next National Workshop.

This report is an effort to follow the above instructions from the National Workshop participants. The data used were collected from Canadian and United States growing areas. The various areas, chief investigator, and dates of the investigation are shown in Table 1. Over 6,000 estuarine water samples were tested and evaluated during the collaborative study. Five of the studies were published in detail in the Proceedings Shellfish Sanitation Workshop (1961). Supplementary material was submitted and collated in the study. This supplemental material was received from British Columbia, Louisiana, and PHS research in the State of Washington. Thus all shellfish growing regions in North America were represented in the collaborative study.

FECAL COLIFORM TEST

All testing laboratories except one used 44.5°C. water incubation. The other laboratory used 45.5°C. air incubation. In all cases Part 3 of APHA Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish (3rd Edition) 1962 was stressed as the acceptable procedure for testing. The fecal coliform test was performed in conjunction with the coliform test as a confirmatory procedure. Thus, direct correlation with the coliform test was obtained. The ratios of fecal coliform to coliform MPN derived from probability plots at arbitrary coliform ranges are presented in Table 2.

In general, as the coliform MPN became greater the ratio of fecal coliform to coliform organisms was less. Most areas gave comparable results. Unfortunately the raw data from Areas A and D were not available. Hence certain computations were necessary. Theoretical ranges for coliform and fecal coliform densities were plotted from data available in Area A. In Area D percentile levels for coliform and fecal coliform MPN's were available. Arithmetic means were determined. The fecal coliform to coliform ratios were derived from these means. Data from Areas B, E, F, G and H were taken from raw data presented at the 1961 Workshop or through communication with the individual investigator.

The 50 percentile ratios at low level coliform MPN's (2.0-7.0) were from .24 to 1.00. The ratio of middle MPN's (71 to 230) fecal coliform to coliform ranged from .11 to .50 at the 50 percentile level. At the higher levels of coliform MPN's (240 or greater) the ratio of fecal coliform to coliform organisms at the 50 percentile level range was .05 to .32. With a constant source of pollution the fecal coliform MPN's showed a low ratio to the coliform MPN's near the source. However, as the pollution flowedtoward the mouth of the various estuaries there was an indication that the non-fecal coliform organisms had a higher rate of dieoff than the fecal coliform organisms. Thus the ratio of fecal coliform to coliform MPN was higher in the clean areas than in the polluted areas. Area C was a good example as this bay is subjected to high seasonal runoff from various farm lands adjacent to the estuarine area tested.

In all areas as the pollution decreased the ratio of fecal coliform to coliform MPN increased. This would indicate a differential dieoff of non-fecal coliform organisms as the pollution potential decreased. Thus the fecal coliform index would reveal a more consistent and constant value for enumerating the pollution potential.

The effect of incubation time and temperature on the E.C. test for fecal coliform organisms has been investigated by the Alabama State Public Health Laboratory (1964) and the Northwest Shellfish Sanitation Laboratory, Purdy, Washington (1962) (1963). Results of tests incubated for 24 and 48 hours as well as at 44.5 and 45°C. (water bath incubation), are shown in Tables 3 and 4.

The Mobile Bay study and the Purdy study revealed that 96% and 99% respectively of all fecal coliform organisms isolated were positive within 24 hours incubation at 44.5°C. Only 0.4% more *E. coli* organisms were recovered after 48 hours incubation in the Mobile Bay study and 0% in the Purdy study. The gain of 3.8% and 0.8% of fecal coliform organisms from Mobile Bay and Purdy respectively does not appear to be significant reasoning to extend the incubation period to 48 hours. Information obtained from the Oregon State Public Health Laboratory indicated that of a total of 3,162 positive E.C. tubes, 96.3% were positive within 24 hours incubation at 44.5°C.

When E.C. tubes were inoculated in duplicate and incubated at both 44.5°C. and 45°C. there was no apparent loss of *E. coli* organisms at 45°C. There was a 50% loss of non-*E. coli* organisms at 45°C. incubation when compared with 44.5°C. incubation in the Purdy study. The Mobile study revealed a loss of 97% in non-*E. coli* organisms with an increase of 0.5°C. incubation. Thus the 44.5°C. incubation temperature recovered from two to four times more non-*E. coli* organisms than the 45°C. incubation.

Not including these non-*E. coli* organisms could have a direct bearing on the significance of the fecal coliform MPN. Results of a study by Beck and Presnell (1963) are shown in Table 5. Fecal coliform cultures from raw sewage and polluted water, consisted of 54% and 19% respectively non-*E. coli* organisms. Sea water samples had

10% non-*E. coli* cultures. Thus incubation at 45°C. would increase the potential loss of 5 to 25% of the fecal coliform organisms in the Pacific Northwest and 10 to 50% in the Gulf area.

From the data presented on comparative time and temperature for incubation of the E.C. test the following conclusions may be drawn:

1. The 24 hour incubation at 44.5°C. did not affect the recovery of *E. coli*.
2. The 24 hour incubation at 44.5°C. reduced recovery of non-*E. coli* fecal coliform organisms by 17% in Mobile Bay and 11% at Purdy.
3. At 45°C. incubation there was no significant reduction in recovery of *E. coli* at either 24 or 48 hours incubation.
4. There was significant reduction in non-*E. coli* fecal coliform organisms when incubated at 45°C. for only 24 hours. Some recovery was noted with 48 hour incubation at 45°C., but this was less than 50% of those recovered at 44.5°C. within 48 hours.

   It is therefore recommended that should one desire only *E. coli* the use of 44.5°C. or 45°C. for 24 hours is satisfactory. Where fecal coliform organisms are desired the incubation time-temperature relationship may be set at 44.5°C. for 24 hours.
5. In view of evidence presented herein the use of the fecal coliform MPN rather than *E. coli* would be more appropriate for the bacteriological survey of shellfish growing waters.

STANDARDS FOR FECAL COLIFORM TEST

In recent years the present bacteriological standard for shellfish growing areas has been questioned in many geographical locations. The use of the coliform index has been fraught with criticism due to the non-specificity of the indicator organism. High runoff from undomesticated land has contributed to high coliform levels in estuarine areas where no known source of pollution could be ascertained. Yet the bacteriological survey must remain an important adjunct to the Sanitary Survey of Growing Areas by definition (1962). Kelly (1960); Presnell (1961); Kelly *et.al*. (1962); Beck *et.al*. (1963) and Kabler *et.al*. (1964) have shown that the fecal coliform organism may be a more realistic indicator of pollution from warm blooded animals than the coliform organism.

In order to evaluate the data presented on fecal coliform results at the last Shellfish Sanitation Workshop (1961), fecal coliform ranges were determined for three levels of pollution. These levels were expressed by the individual investigators. In most cases the nomenclature was in line with requirements of Sanitation of Shellfish Growing Areas (1962) and the results are shown in Table 6.

Areas such as A, B, C, D, and H indicated a fluctuation between the clean and polluted classification. It is possible that these areas could not be classified as clean during certain periods of the year. The trend toward being characterized as a polluted area was correlated with heavy runoff.

Including values under the most unfavorable hydrographic conditions the median MPN value for all areas tested was 35 at the 90 percentile level with a range from 9.0 to 150. The 50 percentile level ranged from a MPN of <3.0 to 9.1 and a median MPN value of 3.5.

The same data was set into classifications by coliform MPN's. These classifications were for coliform ranges of <1.8 - 230; and 240 or more. Corresponding fecal coliform MPN's for each classification were arrayed and plotted on probability plots. The results at various percentile levels are shown in Table 7.

For the coliform MPN range of <1.8 - 230 the fecal coliform index was quite consistent among the various geographical areas. In comparing the fecal coliform MPN's with present coliform standards for shellfish growing areas, the highest 50 percentile level in the areas with coliform range of <1.8 - 230 was 4.8. In the same coliform range the highest 90 percentile level for fecal coliform MPN's was 37.

The median values as shown in Tables 6 and 7 were remarkably similar. However, individual areas such as B, D and F showed much higher 90 percentile levels when classified by sanitary survey than when they were categorized on the coliform index. The range for fecal coliform MPN's in Table 7 was much lower than that demonstrated in Table 6. Thus Table 6 would indicate intermittent pollution in some of the individual "clean" areas.

Where standards are to be set for a new group of indicator organisms certain mitigating circumstances such as the exceptions noted above would tend to allow the standard to be set at a compliance level. However, compliance is not the sole factor when setting standards for public health protection. Interviews were held with persons involved where areas have a rapid change from clean to questionable growing waters. In all cases those interviewed agreed that the following standard for fecal coliform MPN's in shellfish growing waters could be obtained with closer coordination between oceanographic data, and sanitary and bacteriological surveys.

Therefore, the following standard for fecal coliform MPN's in shellfish growing waters is recommended:

.....that in an approved growing area the fecal coliform median MPN of the water does not exceed 7.8 per 100 ml., and not more than 10% of the samples shall exceed an MPN of 33 per 100 ml. for a 5-tube decimal dilution test (or 46 per 100 ml. where the 3-tube decimal dilution test is used).

The fecal coliform test is a relative new test to certain regions wherein shellfish growing areas are tested. At the present time the fecal coliform test is listed only as a tentative method in APHA Recommended Procedures (1962). Standardization of the water bath which is vital to the test has not been accomplished by all official laboratories to date. Therefore, it is further recommended that the fecal coliform standard be made an alternate standard until the next Shellfish Sanitation Workshop. After this period the cooperative program could then determine whether or not these standards would be applicable as permanent standards. The above standards could be met in most growing areas typified by the reports summarized herein. However, certain of these areas would, by necessity, either be resurveyed or closed at periodic seasons due to the influx of pollution. Under no circumstances should these recommended standards be used to usurp sanitary surveys and other criteria for approved areas as outlined in Sanitation of Shellfish Growing Areas, Part 1, Section C.

WORKSHOP PROPOSAL

Analysis of data presented at the 1961 National Shellfish Sanitation Workshop and analysis of data collected since that time on coliforms and fecal coliforms in shellfish growing waters indicates that establishment of an alternate bacteriological standard for shellfish growing waters might be worthy of consideration by this Workshop. If the Workshop is in agreement with this proposal, the following changes in Section C of Part 1 of the Manual are proposed:

Suggested Change, Page 13, Item 3 Approved Areas:

It is proposed that a new sub-item (d) be added after item C which would read as follows:

Agencies not desiring to use the above shellfish growing water standard may alternately use the following:

The fecal coliform median MPN of the water does not exceed 7.8 per 100 ml. and not more than 10% of the samples exceed a fecal coliform MPN of 33 per 100 ml.; (or 46 per 100 ml. where a 3-tube decimal dilution test is used) in those portions of the area most probably exposed to fecal contamination during the most unfavorable hydrographic and pollution conditions. (Note: Under no circumstances should these standards be used to usurp sanitary surveys and other criteria for approved areas as outlined in Sanitation of Shellfish Growing Areas, Part 1, Section C.)

ACKNOWLEDGEMENTS

The author wishes to thank the various participants in the cooperative study for voluminous amounts of data related to this study. Only through the availability of this data could a summarization be made.

REFERENCES

1960 Kelly, C. B., Bacteriological Criteria for Market Oysters, Robert A. Taft Sanitary Engineering Center (Cincinnati, Ohio). Technical Report F60-2.

1961 U. S. P. H. S. Proceedings Shellfish Sanitation Workshop.

Ibid. Blair, Thomas P. and Michener, K. L., Sanitary Survey of Tillamook Bay and Sanitary Significance of the "Fecal" Coliform Organisms in Shellfish Growing Area Waters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961.

Ibid. Hope, J. A., and Wiley, C. W., Coliform E.C. Gas Positive Relationships in Shellstock, Sea Water and Bottom Sediments from Areas of Varying Bacterial Quality, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961.

Ibid. Hosty, Thomas S., Kelly, C. B., Beck, A. N., Wright, G. R., Crockett, Jr., J. L., and Phillips, W. S., The Significance of E.C. Positive Organisms in Gulf Shellfish Growing Waters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961.

Ibid. McCarthy, Joseph A., Collaborative Study of Sanitary Significance of E.C. Positive Organisms in Shellfish Growing Waters (Report of Activities of Massachusetts Department of Public Health), Proceedings Shellfish Sanitation Workshop, November 28-30, 1961.

Ibid. Tennant, A. D., Reid, J. E., and Rockwell, L. J., An Evaluation of the E.C. (44.5°C.) Confirmation Test for the Estimation of Escherichia coli Densities in Sea Water and Shellfish, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961.

1961 Presnell, M. W., Sanitary Significance of "Fecal Coliform Organisms" in a Shellfish Growing Area - Sanitary Survey of Burley Lagoon, 1961 Shellfish Sanitation Research Conference, Purdy, Washington.

1962 APHA Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish, (3rd Edition).

1962 Jensen, E. T., Sanitation of Shellfish Growing Areas, (1962 Revision) Part 1, Section C.

1962 Kelly, C. B., Beck, W. J., Presnell, M. W., Zobel, K. J., Ecological Study of Bacterial Indices of Pollution, 1962 Shellfish Sanitation Research Conference, Purdy, Washington.

1963 Beck, W. J., Presnell, M. W., and Hoff, J. C., Ecological Study of Bacterial Indices of Pollution, 1963 Shellfish Sanitation Research Conference, Purdy, Washington.

1964 Hosty, Thomas, Alabama Public Health Laboratory, personal communication.

1964 Kabler, P. W., Clark, H. F., and Geldrich, E. E., Sanitary Significance of Coliform and Fecal Coliform Organisms in Surface Water, Public Health Reports, Vol. 79, No. 1, January 1964, pp. 58-60.

1964 Copp, S. S., Regional Engineer, personal communication.

1964 Hauser, George H., Division of Laboratories, Louisiana State Board of Health, personal communication.

1964 Michener, Kenneth, Public Health Laboratories, Oregon State Board of Health, personal communication.

Table 1. Location of Fecal Coliform Collaborative Study in Shellfish Growing Waters

Location	Areas	Chief Investigator	Dates of Study
Alabama	Mobile Bay	Thomas Hosty	1960 - 62
British Columbia	Boundary Bay	S. S. Copp	1963 - 64
Louisiana	Mississippi Sound St. Bernard Parish Plaquemine Parish Calcasieu Parish Lake Charles Parish	George Hauser	1959 - 64
Massachusetts	Newburyport Essex River Merrimack River	Joseph McCarthy	1959 - 60
Oregon	Tillamook Bay Yaquina Bay Coos Bay Netarts Bay	Thomas Blair	1960 - 63
Quebec & P. E. Islands	St. Lawrence River Estuary Prince Edward Islands	A. D. Tennant	1959
Virginia	Chesapeake Bay	J. A. Hope	1959 - 60
Washington	Burley Lagoon	M. W. Presnell	1959 - 63

Table 2. Ratio Fecal Coliform/Coliform MPN from Estuarine Water Samples as Found at Various Coliform Levels

		Ratio Fecal Coliform/Coliform MPN Percentile		
Area	Number Samples	10	50	90
Coliform Range 2.0 thru 70				
A	536	.16	.40	1.00
B	21	.16	.67	1.00
C	283	.07	.24	.86
D	1,778	.45	.63	1.00
E	182	.12	.37	1.00
F	95	.23	1.00	1.00
G	346	.17	.43	1.00
H	1,223	.23	1.00	1.00
Coliform Range 71 thru 230				
A	199	.45	.50	1.00
B	5	.11	.50	1.00
C	316	.025	.11	.46
D	492	.16	.24	1.00
E	64	.04	.16	.71
F	26	.09	.33	1.00
G	94	.07	.23	.77
H	218	.05	.31	1.00
Coliform Range 240 or greater				
A	233	.32	.32	.40
B	39	.02	.30	1.00
C	1,105	.006	.05	.39
D	1,260	.26	.32	.33
E	52	.04	.15	.63
F	92	.02	.17	1.00
G	237	.03	.20	1.00
H	278	.03	.23	1.00

Table 3. Recovery of Coliform Types from E.C. Test

Location	Pos. Tubes	Percent Recovery of Coliform Types					
		24 hours			Additional 24 hours		
		E. coli	Non-E. coli	Total	E. coli	Non-E. coli	Total
44.5°C. Incubation							
Mobile Bay	812	80.1	16.1	96.2	0.4	3.4	3.8
Mobile Bay	8,406	88.4	9.2	97.6	0.3	2.0	2.3
Purdy, Wash.	507	92.8	6.4	99.2	0.0	0.8	0.8
45°C. Incubation							
Mobile Bay	722	89.4	4.6	94.0	0.6	5.4	6.0
Purdy, Wash.	490	96.3	3.1	99.4	0.0	0.6	0.6

Table 4. Recovery of Fecal Coliform at Two Incubation Temperatures

Location	Number Recovered		Percent Loss at 45°C.
	44.5°C.	45°C.	
Mobile Bay	812	722	11.1
Purdy, Wash.	507	490	3.4

Table 5. Fecal Coliform Flora of Polluted and Unpolluted Environments

Sample	Fecal Coliform Cultures Examined	% Incidence Fecal Coliform Types			
		E. coli	A. aerogenes	Intermediates	Other IMVIC Types
Unpolluted Areas					
Water	219	93	6	0.5	0.5
Soil	172	98	1.5		0.5
Sea Water	87	90	9		1
Polluted Areas					
Water	625	81	17	2	
Soil	60	97	1.5		1.5
Raw Sewage	511	46	42	11	1

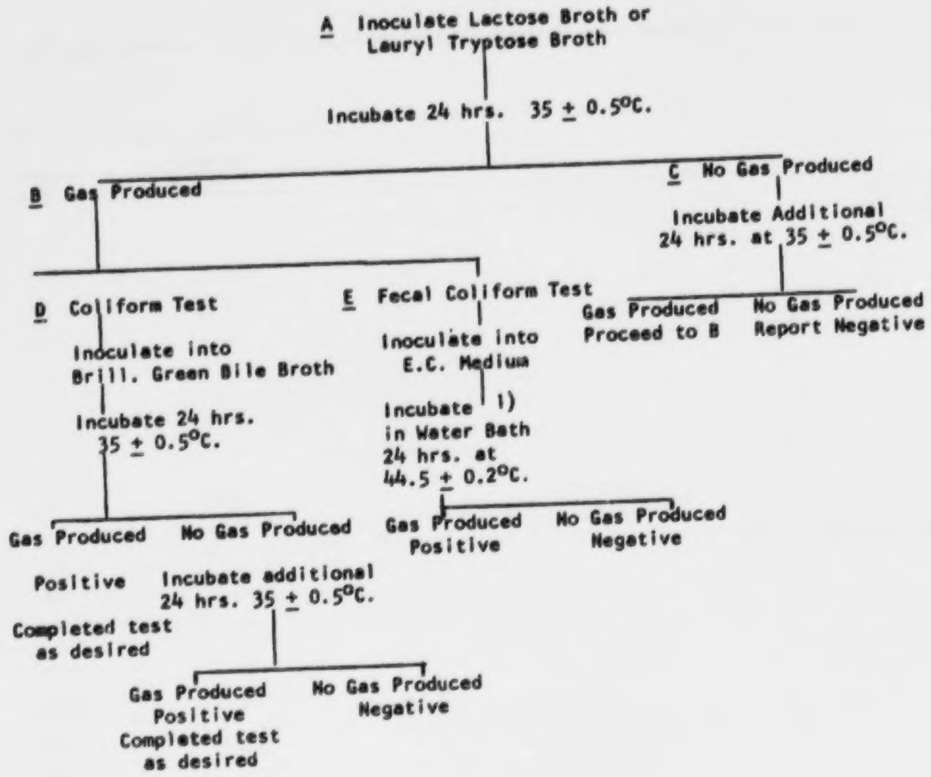
Table 6. Fecal Coliform Range from Various Shellfish Growing Areas in North America

			Percentile Fecal Coliform MPN		
*Area	Samples		50	70	90
Clean					
A	53[illegible]		9.1	14.0	23
B	78		<3.6	<3.6	11
C	1,169		3.0	16	150
D	2,270		2.0	4.8	13
E	412		2.6	8.9	50
G	230		6.1	17.0	75
I	259		7.8	17	52
J	130		5.2	11	30
K	72		<3.0	<3.0	9.0
L	134		4.0	10	39
		Median	3.5	11	35
		Arithmetic Mean	-	-	45
Moderately Polluted					
C	892		8.0	35	290
E	48		27	120	900
G	136		23	58	210
		Median	27	58	290
		Arithmetic Mean	19	71	470
Polluted					
A	432		980	4,300	38,000
B	40		<36	610	13,000
C	468		850	5,000	64,000
D	1,260		29	100	540
G	131		120	300	1,100
		Median	120	610	13,000
		Arithmetic Mean	-	3,400	4,400

* Classification of area made by individual researcher.

Table 7. Fecal Coliform Range from Various Shellfish Growing Areas in North America

Area	Samples		Fecal Coliform MPN/100 ml. Percentile 10	50	90
Coliform MPN <1.8 - 230					
B	96		<3.0	<3.0	11
C	1,411		<3.0	<3.0	17
E	314		<1.8	3.0	18
F	120		<1.8	4.7	37
G	809		<3.0	4.8	29
H	1,654		<1.8	3.7	22
		Median	-	3.4	20
Coliform MPN 240 or more					
B	38		11	400	15,000
C	1,111		<3	92	3,500
E	43		17	80	400
F	92		30	220	1,700
G	251		12	94	750
H	291		<18	110	1,400
		Median	-	100	1,600


A Inoculate Lactose Broth or Lauryl Tryptose Broth
Incubate 24 hrs. 35 ± 0.5°C.
B Gas Produced
C No Gas Produced
Incubate Additional 24 hrs. at 35 ± 0.5°C.
Gas Produced Proceed to B
No Gas Produced Report Negative
D Coliform Test
Inoculate into Brill. Green Bile Broth
Incubate 24 hrs. 35 ± 0.5°C.
Gas Produced
Positive
Completed test as desired
No Gas Produced
Incubate additional 24 hrs. 35 ± 0.5°C.
Gas Produced Positive Completed test as desired
No Gas Produced Negative
E Fecal Coliform Test
Inoculate into E.C. Medium
Incubate 1) in Water Bath 24 hrs. at 44.5 ± 0.2°C.
Gas Produced Positive
No Gas Produced Negative

1) Where the 45.5°C. air incubation is utilized comparative tests with water bath tests should be made to determine comparable time of incubation.

Fig. 1 Diagram for Coliform and Fecal Coliform Tests

APPENDIX T

INTERIM BACTERIOLOGICAL CRITERIA FOR OYSTERS

By

C. B. Kelly
Shellfish Sanitation Branch
Public Health Service

The development of satisfactory criteria of quality for shellfish as received at the market has been continuously progressing since the early days of shellfish sanitation. The degree of interest in this problem can be measured by discussion at the last three Shellfish Sanitation Workshops where reports of collaborative studies and reports by individual workers have been presented and discussed.(1,2,3,4,5,6,7) In 1956,(1) after consideration of a large mass of data the Workshop adopted a bacteriological standard to be applied to shucked oysters as received at the market. The standards were regarded as for interim purposes. They set as upper limits of acceptability coliform MPN 16,000 per 100 grams and plate count of 1,000,000 per gram.

At the same time, however, the Workshop recognized the gross deficiencies in attempting to work with coliform organisms as an index of quality and serious doubt was expressed as to the practicality of these coliform limits. The change in acceptable coliform limit from the former standard MPN 2400 to MPN 16,000 reflected the lack of confidence of the group on the significance of these coliform organisms. The change met with objection from northern interests and rightfully so because coliform levels of 16,000 per 100 gram in oysters harvested or processed in northern areas would quite likely indicate serious pollution or contamination. The data presented included evidence that high coliform densities were obtained in shell and shucked oysters in the face of evidence that these oysters were from safe approved areas and had been processed in approved plants in conformity with the requirements of the Shellfish Manuals. It was quite evident to the group that the coliform group failed in its prime purpose to reveal whether the shellfish had been harvested from polluted areas or had been exposed to dangerous contamination during handling and processing after removal from the water. A recommendation, therefore, was made that serious consideration be given to the validity of the coliform group as an index of quality and that simultaneous investigations be conducted to evaluate the significance of other bacterial indices. The fecal coliform group was suggested as a possible substitute for the coliform group.

In partial fulfillment of this charge, a report on an interstate cooperative study to evaluate bacteriological criteria for market oysters was presented at the 1958 Shellfish Sanitation Workshop.(4) This study as in others that preceded and followed involved the bacteriological examination of oysters from key points in all commercial handling processes from shucking to delivery to the market. A feature of this study was the development and evaluation of a method for the estimation of fecal coliform organisms following a procedure originally developed by Hajna and Perry.(8) Gross increases in coliform organisms were observed during normal, acceptable commercial practices. The magnitude of changes in coliform organisms was of the same order as those observed in plate counts. The results clearly demonstrated the inadequacy of the coliform group as an indicator of sanitary quality of shellfish. It was, therefore, concluded that the plate count was of equal significance in revealing chance contamination or violations of acceptable storage time and temperature. On the other hand, the results of the examinations for fecal coliform organisms revealed a much higher degree of stability as the shellfish proceeded through commercial channels and thus suggested the greater suitability of this parameter as an index of sanitary quality at the market level. The collaborative evaluation of the method for fecal coliforms revealed that it was reliable in the hands of all of the cooperating investigators provided that certain requirements, particularly temperature of incubation was rigidly adhered to.

In the light of the findings of this report, the 1958 Workshop adopted(9) an interim bacteriological standard for fresh and frozen oysters at the market level. The standard regarded as satisfactory, shucked oysters with the fecal coliform density of 78 or less and a plate count of 100,000 or less. Oysters with fecal coliform MPN's between 79 and 230 and plate count between 100,000 and 500,000 were regarded with greater suspicion and considered as acceptable in occasional samples. Those with fecal coliform MPN's in excess of 230 and/or plate counts in excess of 500,000 were considered as unsatisfactory and subject to rejection. The Workshop recommended that the standard be adopted for a two year period. It was also recommended that the cooperative studies be extended to evaluate the applicability of these criteria.

EFFECT OF COMMERCIAL HANDLING

Studies continued in the interim between the 1958 and 1961 Workshop followed procedures established for the earlier investigations. It was wider in scope, however, since the City of Chicago accepted the interim standard and applied the test for fecal coliform organisms to oysters as received in the wholesale market. Data from this large receiving and distributing center was an important factor in the interstate cooperative study. The report on the study included data on more than 3,000 samples of shell and shucked oysters collected at various points in the commercial handling chain. Points of sampling included the shell stock on arrival at the shucking house, the product as shucked, as received and repacked in repacking establishments, and as received in the marketing areas. In general, results obtained were quite similar to those reported in 1958. (Tables 1 and 2) Gross changes in coliform density and plate counts again were observed. Changes in fecal coliform organisms again demonstrated the greater stability of this group of organisms.

The coliform and fecal coliform densities of oysters as delivered to the shucking house during the winter months in general reflect the low levels found in shell oysters as harvested. Plate counts were proportionately low. Shell stock as received at the shucking houses during the summer showed quite higher coliform MPN's and plate counts than in the winter. These higher bacterial levels in shell stock during the warmer seasons are due mainly to bacterial multiplication. It is inconceivable that shellfish taken from approved areas showing an average coliform MPN of 70 would show bacterial counts of the order of magnitude demonstrated in the examination of shell oysters on the shucking bench. That multiplication does take place in shell oysters after removal from the water was demonstrated in the Gulf Coast studies presented by Presnell and Kelly.(10)

The shucking process did not contribute materially to the fecal coliform content. In fact, in many instances the values for shucked oysters are lower than for shell stock. The picture for coliform organisms and plate count is not clear. On some occasions significantly higher values are found, on other occasions there was not much change. The effect of time and temperature again becomes evident in the data for the product as received at repacking houses or as received at market. The coliform and plate count levels attained at these points are very much higher than that of the product of the shucking houses as collected at the shucking houses. Again the relative stability of the fecal coliform organisms becomes apparent although the higher densities, particularly in the upper percentile levels of the shucked oyster samples suggests adverse time-temperature situations.

SIGNIFICANCE OF INDICATOR ORGANISMS

During the past three years a number of investigations have produced scientific evidence quite pertinent to the establishment of bacteriological criteria. The vast amount of work(11,12,13,14,15,16,17) done in the collaborative study to evaluate indicator organisms for shellfish growing areas presented at the 1961 Workshop, but unavailable in advance of that meeting, has contributed much toward an understanding of the significance of these organisms. Continuation of these studies and investigations in the ecological aspects of indicators of pollution conducted by the Shellfish Sanitation Laboratory and the Sanitary Engineering Center are pertinent and finally a series of studies of the time-temperature effect of storage of shucked shellfish on the bacterial quality are of particular importance in interpreting the results of the past cooperative studies. It is the purpose of this report to discuss these recent findings and to apply this knowledge to a better interpretation of the technological data collected through the years.

Recent work including the many reports presented at the 1961 Shellfish Sanitation Workshop has resulted in a new look at the real sanitary significance of the traditional coliform group of organisms as indicators of pollution. The 1961 Workshop reports reviewed and summarized by Mr. Beck(18) and presented at this Workshop present evidence that fecal coliform organisms are a more meaningful indicator of pollution than the coliform group. This contention is supported by an extensive ecological study in an estuarine area in the State of Washington(17,19) and investigations of Kabler, Clark, Geldrich(20) and others in assessing the sanitary significance of coliform and fecal coliform organisms in surface waters. These latter two works come to the similar conclusion that fecal coliform test results are more specific in revealing the presence of fecal pollution than the coliform tests in assessing water quality. Since shellfish are reflective of the marine environment in which they grow, the greater suitability of fecal coliforms as an index of pollution would also apply to shellfish.

The past three years has also seen technological studies on the effect of commercial handling on the coliform, fecal coliform and plate count densities of shellfish. Studies conducted by the Shellfish Sanitation Laboratory at Pensacola, Florida(10) included the first of the recent series of studies on the comparative behavior of the three parameters under controlled time-temperature situations. Of particular significance is the series that compared the behavior of indicator organisms with a selected group of Salmonella. At 4 to 7°C. coliforms and plate counts showed identical behavior, a rapid rise throughout a six day period while fecal coliforms and Salmonella both showed little or no change. At 20°C.(68°F.) parallel multiplication of all organisms occurred including the Salmonella and the fecal coliform organisms. These investigations prompted more closely controlled studies at the Gulf Coast Research Center and at the Northwest Shellfish Laboratory at Purdy, Washington. The results, reported in another presentation at the current Workshop(21) showed multiplication of coliform and plate count organisms in oysters packed in ice and stored under dry refrigeration at 3°C.(38°F.) throughout a twenty-five day period of storage. Fecal coliforms show a low rate of decline throughout the same period of time. Of particular importance is the extremely rapid rise in both coliform and plate count in oysters stored at 10°C.(50°F.). The rate of increase at this temperature far exceeds that of the oysters stored in ice and at 3°C. In fact, the bacterial densities attained at five days storage at 10°C. exceeded by at least tenfold those attained during the entire twenty-five days storage at the lower temperatures. It is also important that at 50°F. multiplication of fecal coliforms was observed in many of the lots of both Pacific and Eastern oysters studied.

OTHER SPECIES OF SHELLFISH

The applicability of the fecal coliform and plate count criteria to Pacific oysters was investigated by the State of Washington over a complete oyster season.(22) Results obtained on 333 samples from various wholesale establishments in the Seattle area indicate a 90% conformity with fecal coliform MPN 230. Conformity with plate count 500,000 was also 90% in samples collected during the warmer months. Ninety percent of the winter samples showed plate counts of 100,000 or less. Studies on soft clams were conducted in a collaborative study(23) undertaken by the States of Maryland, New York, New York City, and the Public Health Service over a two year period. The study involved the examination of shell soft clams at key points from harvesting to delivery at the market. It was concluded from this investigation that soft clam shell stock harvested in Maryland waters, can conform to the current tentative bacteriological standards for market oysters provided the harvesting areas meet the 1962 Cooperative Program requirements and recommended harvesting to market handling procedures are followed as stated in Part II of the Cooperative Program Manual. In Europe, the fecal coliform group has been the accepted indicator of quality of shellfish since 1947 and before in some countries. In England, the tests described by Knott and applied by the Worshipful Fishmongers(24) and the method of Clegg and Sherwood(25) both involve incubation at 44°C. in a water bath, thus the organisms detected are somewhat the same as those enumerated by the modified Eijkman procedure. Modifications of tests for fecal coliform organisms are also used in France and in Holland.(26)

DISCUSSION

Technological studies conducted during the past few years and recently reported are helpful in the interpretation of the results of cooperative studies to evaluate the applicability of the tentative market standards for shucked oysters. Probably the most revealing have been the numerous investigations on the bacterial changes in shucked oysters during storage at refrigerated temperatures. These show that high rates of multiplication of coliform organisms and plate count occur at the currently accepted temperature of 50°F. and that the oysters will not remain in saleable condition for much more than five to seven days. Storage at this temperature does more than effect the aesthetic quality of the food product since in many of the tests multiplication of *E. coli* and fecal coliform organisms was also demonstrated. The significance of the multiplication of these organisms assumes some proportion when one considers that experimental evidence has demonstrated a parallel behavior of Salmonella in oysters. It is,therefore, no surprise that shucked oysters as sampled at the market showed a wide range of bacterial densities and that these densities were consistently much higher than those that prevailed in the product as sampled in shucking establishments. The occurrence of low bacterial densities is at least in part due to the fact that in many cases the oysters were adequately refrigerated. The practice of packing containers of shucked oysters in ice is not uncommon and could account for the relatively high percentage of low bacterial count oysters on the market.

Because coliform multiplication does take place even in oysters packed in ice, the value of this group as an indicator of pollution is practically nil. It, therefore, becomes of use only to reflect the time-temperature history of shucked oysters and it is likely that the more accepted plate count indicator would be a more suitable test for this purpose. The stability of the fecal coliform group, particularly at temperatures near 40°F. confirm the premise that this group of organisms would offer a better indication of the quality of the product from the sanitary viewpoint. The greater suitability of fecal coliform organisms as an index of pollution in shellfish growing areas offers confirmation of the applicability of this group in assessing the sanitary quality of shellfish at the market.

While similar studies are still lacking with regard to other species of shellfish the results of recent investigations certainly suggest the applicability of the criteria of quality to West Coast species of shucked oysters, particularly Pacific oysters. A high degree of conformity with the tentative market standards was demonstrated in studies of the quality of that product both in shucking houses and as on arrival at the market. Limited studies suggests that the standards may be applicable to soft clams.

The data recently gathered offers evidence for the acceptability of the currently tentative market criteria for all shucked oysters at the market level and it would thus, appear that these criteria would serve as a useful tool to the consuming States in assessing the quality of the product on arrival at the market. Certain admonitions must be made however. The quality of the product will not be maintained unless the shellfish are held at adequate refrigeration temperatures and these are lower than the current Manual upper limit of 50°F. Storage at temperatures close to 40°F. will not result in serious deterioration within the time the product is usually in transit.

The bacteriological criteria should be considered as an indicator of the quality of the product and as such the term conditional is properly applied to those samples showing fecal coliform MPN's more than 230 and/or plate counts more than 500,000. Therefore, rejection on the basis of a single result is not desirable although still within the authority of a State or other governmental agency. The preferable procedure is, as stated in the following proposal for the agency in the receiving State to take action based on operational reports requested from the shellfish regulatory authority at the point of origin.

RECOMMENDATIONS

The following standards are recommended to be applied to all shucked oysters at the wholesale level as received by interstate shipment. Except for four changes, the standards are the same as the current interim criteria for shucked Eastern oysters. The first two changes are suggested to accomplish uniformity with the recommended criteria for shellfish growing areas. The third change would more accurately define the technique for bacteria counts and the fourth would convert the numerical expressions of density to currently accepted terms. The changes are:

1. Substitute "fecal coliforms" for "E. coli".

2. Revise the definition of the fecal coliform group. Change the incubation period from 48 to 24 hours, and stipulate the conditions for use of 45.5°C. air incubation.

3. Substitute "plate count per gram" for "total bacteria per ml."

4. Substitute "MPN per 100 grams" for "MPN per 100 ml."

Accordingly, it is the recommendation of the Public Health Service that the Workshop adopt the following proposed standard for shucked oysters:

Bacteriological Standards for Shucked Oysters at the Wholesale Market Level

Satisfactory

Fecal coliform density* of not more than 230 MPN per 100 grams and 35°C. plate count** of not more than 500,000 per gram will be acceptable without question.

Conditional

Fecal coliform density of more than 230 MPN per 100 grams and/or 35°C. plate count of more than 500,000 per gram will constitute a conditional sample and may be subject to rejection by the State shellfish regulatory authority. If these concentrations are found in two successive samples from the same shipper, the State regulatory authority at the source will be requested to supply information to the receiving State concerning the status of operation of this shipper. Future shipments to receiving markets by the shipper concerned will depend upon satisfactory operational reports by the shellfish regulatory authorities at the point of origin.

* Fecal coliform organisms are those which, on transfer to E.C. medium from gas positive presumptive broth tubes show production of gas after incubation in a water bath at 44.5°C. ± 0.2°C. for 24 hours. Where air incubation is at 45.5°C. ± 0.2°C. utilized comparative tests must be made to determine comparable time of incubation.

** Plate count is the number of bacteria determined by the "Standard Plate Count" procedure for shellfish described in the third edition of the APHA Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish.

REFERENCES

1. Kelly, C. B., Bacteriological Examination as an Indicator of Sanitary Quality of Market Shellfish, Proceedings Shellfish Sanitation Workshop, August 27-28, 1956, U. S. Department of Health, Education, and Welfare.

2. Brinsfield, C. S., Bacteriological Examination of Shellfish as an Indicator of Market Quality, Proceedings Shellfish Sanitation Workshop, August 27-28, 1956, U. S. Department of Health, Education, and Welfare.

3. Bynoe, E. T., Bacterial Standards for Shucked Oysters on the Canadian Market, Proceedings Shellfish Sanitation Workshop, August 27-28, 1956, U. S. Department of Health, Education, and Welfare.

4. Kelly, C. B., Results of a Cooperative Study to Evaluate Present Bacteriological Criteria of Market Oysters, Proceedings Shellfish Sanitation Workshop, August 26-27, 1958, U. S. Department of Health, Education, and Welfare.

5. King, E. F., Letter from the Chicago Board of Health and Supporting Laboratory Data, Proceedings Shellfish Sanitation Workshop, August 26-27, 1958, U. S. Department of Health, Education, and Welfare.

6. Hauser, G. H., Bacteriological Quality of Market Oysters in Louisiana, Proceedings Shellfish Sanitation Workshop, August 26-27, 1958, U. S. Department of Health, Education, and Welfare.

7. Kelly, C. B., Results of Interstate Collaborative Study to Evaluate Interim Bacteriological Standards for Shucked Oysters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

8. Hajna, A. A., and Perry, C. A. 1943, Comparative Study of Presumptive and Confirmatory Media for Bacteria of the Coliform Group and for Fecal Streptococci, American Journal of Public Health, 33, 550-556.

9. Proceedings Shellfish Sanitation Workshop, August 26-27, 1958, U. S. Department of Health, Education, and Welfare, p. 11.

10. Kelly, C. B., and Presnell, M. W., Bacteriological Studies of Commercial Shellfish Operations on the Gulf Coast, Technical Report F61-9, pp. 20-26, Robert A. Taft Sanitary Engineering Center, U. S. Department of Health, Education, and Welfare, Cincinnati, Ohio.

11. McCarthy, J. A., Collaborative Study of Sanitary Significance of E. C. Positive Organisms in Shellfish Growing Waters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

12. Brown, R. M., Coliform and E.C. Determinations, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

13. Hope, J. A., and Wiley, C. W., Coliform E.C. Gas Positive Relationships in Shellstock, Sea Water and Bottom Sediments from Areas of Varying Bacterial Quality, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

14. Hosty, T. S., The Significance of E.C. Positive Organisms in Gulf Shellfish Growing Waters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

15. Tennant, A. D., Reid, J. E., and Rockwell, L. J., An Evaluation of the E.C. (44.5°) Confirmation Test for the Estimation of Escherichia coli Densities in Sea Water and Shellfish, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

16. Blair, T. P., and Michener, K. L., Sanitary Survey of Tillamook Bay and Sanitary Significance of the "Fecal" Coliform Organisms in Shellfish Growing Area Waters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

17. Kelly, C. B., and Presnell, M. W., Sanitary Significance of Fecal Coliform Organisms in a Shellfish Growing Area. Sanitary Survey of Burley Lagoon, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

18. Beck, W. J., Bacteriological Criteria for Shellfish Growing Areas, Presented at 1964 Shellfish Sanitation Workshop.

19. Beck, W. J., Presnell, M. W., and Hoff, J. C., Ecological Study of Bacterial Indices of Pollution, 1963 Shellfish Sanitation Research Conference, Purdy, Washington.

20. Kabler, P. W., Clark, H. F., and Geldrich, E. E., Sanitary Significance of Coliform and Fecal Coliform Organisms in Surface Water, Public Health Reports, Vol. 79, No. 1, Jan. 1964, pp. 58-60.

21. Kelly, C. B., Time-Temperature Effect on Bacteriological Quality of Stored Oysters, Presented at 1964 Shellfish Sanitation Workshop.

22. Kelly, C. B., Presnell, M. W., and Zobel, K. J., The Effect of Commercial Handling and Storage on the Bacteriological Quality of Pacific Oysters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

23. Fester, J. W., and Hunt, D. A., Traced Lot Study, Harvest to Market, of the Soft Shell Clam (Mya arenaria), in the Cooperative Study Involving Maryland, New York City, New York State, and Public Health Service Shellfish Agencies, July 1963 to December 1963, Northeast Shellfish Sanitation Research Center, Narragansett, Rhode Island, U. S. Department of Health, Education, and Welfare.

24. Knott, F. A. 1951, Memorandum on the Principles and Standards Employed by the Worshipful Company of Fishmongers in the Bacteriological Control of Shellfish in London Markets, Worshipful Fishmongers Company, London, England.

25. Clegg, L. F. L., and Sherwood, H. P., The Bacteriological Examination of Molluscan Shellfish, The Journal of Hygiene, Vol. 45, No. 4, December 1947.

26. Mazieres, J., Les Coliformes Dans Les Eaux Marines Et Les Huitres Application A L'hygiene Ostreicole, Revue Des Travaux De L'Institut Des Peches Maritimes, Institut Scientifique Et Technique Des Peches Maritimes, Paris, France.

Table 1. Bacteriological Densities of Oysters at Key Points in Commercial Handling

Dec. - Jan. - Feb. - Mar.

	Shucking Plant		Repacker		Market
Percentile	Shell	Shucked	Received	Repacked	
Coliform MPN/100 g.					
10	30	173	420	400	62
50	340	2200	5000	5000	870
90	6600	19000	52000+	22000	56000
No.	222	325	161	53	296
Fecal Coliform MPN/100 g.					
10	<18	<18	<18	<18	<18
50	<18	<18	<18	<18	<18
90	110	85	334	1300	85
No.	221	325	161	53	355
Plate Count/gram					
10	-	-	6000	630	-
50	<1700	3700	31000	7600	61000
90	6300	31000	150000	78000	770000
No.	213	311	159	52	379

Table 2. BACTERIOLOGICAL DENSITIES OF OYSTERS AT KEY POINTS IN COMMERCIAL HANDLING

Apr. - Sept. - Oct. - Nov.

Percentile	Shucking Plant		Repacker		Market
	Shell	Shucked	Received	Repacked	
		Coliform MPN/100 g.			
10	340	480	2900	2700	220
50	2700	3900	21000	20000	13000
90	29000	37000	98000	140000	160000
No.	187	250	88	27	217
		Fecal Coliform MPN/100 g.			
10	<18	<18	<18	<18	<18
50	65	28	150	72	42
90	3300	1100	9400	1300	3700
No.	187	190	115	27	288
		Plate Count/gram			
10	-	1100	13000	4200	7500
50	4000	13000	51000	28000	41000
90	75000	120000	320000	200000	600000
No.	178	242	114	27	288

APPENDIX U

INITIAL SURVEY ON *CLOSTRIDIUM BOTULINUM* TOXIN, TYPE E

By

Dr. Arthur F. Novak
Department of Food Science & Technology
Louisiana State University
Baton Rouge, Louisiana

Since our time is very limited and since most of this material will be published in the Proceedings which will be available shortly, I am going to present a very brief summary of our research on *Clostridium botulinum* type E toxin.

We have collected, under a grant from the United States Atomic Energy Commission, approximately 800 to 1,000 samples, which have been plated out according to recommended procedures that we have obtained from the Department of Health, Education, and Welfare. To date we have not isolated one organism from either shrimp or oysters which could be identified as *C. botulinum*.

However, we started out to collect many samples from growing areas, and areas near growing areas, and just recently we obtained one rather deep mud sample in the intercoastal waterway from which we have isolated a clostridium. It is not *Clostridium botulinum*, and we are not sure that it will synthesize a toxin, but we are investigating this possibility at present.

Now I understand that a short time ago, someone in Europe requested that some mud samples from various Gulf areas be forwarded to him, and from these he had isolated *Clostridium botulinum* from one mud sample obtained around the Galveston Bay area.

Now you know we are here discussing the possibility of health hazards. We are considering numbers of micro-organisms, and I am concerned not necessarily with numbers, but more so with the types. A few pathogenic organisms are likely to be more dangerous than a million non-pathogens.

In summary, we have not isolated one *Clostridium botulinum*, and have not found any type E toxin in any Gulf Coast shrimp or oyster. We are going to continue this work, and presently we are organizing a series of studies in which we will test for the presence of salmonella organisms. We are exploring the possibility of determining whether or not any virus is associated with shellfish from the Gulf Coast.

This poses a difficult problem. Some of the scientists at Parke-Davis Pharmaceutical Company have been working with virus, and we have contacted them to obtain some methods which we might be able to apply. Of course, this is a long story, and there are some shortcomings to the procedures as we intend to use it, but we will study other methods also. So, I hope that within two or three years, or the next time we have a meeting here, I will be able to report on possible viral infections and other types of pathogenic micro-organisms.

If any of you have any questions I would be happy to answer them. I don't want to go into our procedures in detail because they will be published.

I might add that we have surveyed and searched most of the health records from the Gulf States, and we have not found one case of botulism on record which has been attributed to Gulf Coast shellfish. I think this is a real compliment to the shellfish industry.

APPENDIX V

FIELD AND LABORATORY STUDIES ON HEAT-SHOCK METHOD OF PREPARATION OF OYSTERS FOR SHUCKING

By

Somers B. Pringle
Shellfish Section
South Carolina State Board of Health
Beaufort, South Carolina

in cooperation with

Gulf Coast Shellfish Sanitation Research Center
Public Health Service
Dauphin Island, Alabama

A field study, designed to evaluate the commercial heat-shock method of preparation of oysters for shucking in terms of the recommendations of the Cooperative Program, was conducted by the South Carolina State Board of Health in cooperation with the Gulf Coast Shellfish Sanitation Research Center.

In addition to the cooperative field study, a laboratory study was also undertaken by the Research Center. This study was carried out to give a more carefully controlled detailed research evaluation of the heat-shock method of opening oysters.

The objective of the field investigational study as well as the controlled laboratory studies was to evaluate the heat-shock method as practiced in South Carolina and to determine whether the method could be incorporated in the Shellfish Manual on the same basis as is given to the normal cold shucking method or, if this were not indicated, to determine what special requirements might be necessary.

This was to be accomplished by a study of the commercial heat-shock process as measured by accepted bacteriological parameters. Included would be (1) a study of the comparative effect of the heat-shock process and normal cold shucking methods of opening oysters on the bacteriological quality of shucked shellfish meats and (2) an examination of the sanitary aspects of the process. Information about factors which influence the public health aspect of the process would be collected and any sanitary requirements determined and appropriate revisions, if required, inserted in the Manual. The results of the laboratory study would serve to provide information obtained under more carefully controlled conditions.

The field study of the commercial aspects of the process was conducted during January of this year and consisted of the bacteriological examination of traced lots of oysters taken from various stages of the heat-shock process as well as the examination of the immersion water. The oyster samples represented shellstock opened before immersion, immediately after immersion and after remaining on the shucking bench for various lengths of time. The water samples represented the immersion water at the time the oysters were dipped.

Five commercial plants were involved in the cooperative study. The study of the sanitary aspects of the process in each plant was accomplished by recording information on harvesting area, date and time of harvest, length of storage and storage conditions, ambient air temperature, volume and temperature of immersion water, volume of oysters per dip, period of time of heat shock, condition of shellstock and any unusual condition of processing. Forms were developed and used to standardize the recording of this information.

The water and oysters were examined for coliform and fecal coliform MPNs and by standard 35°C. plate counts.

In the laboratory investigations particular attention was given to the bacteriological quality of the oyster, however, investigations as to the effect of the heat-shock method on the chemical and physical quality of the oyster were also initiated.

For these investigations, a specially designed all glass water bath with a constant agitation of distilled water was used for immersion of the oysters. The temperatures were controlled with an electric immersion heater in an outer water bath coupled with an electronic thermoregulator. Both Alabama oysters and South Carolina oysters were used in the laboratory studies.

The heat-shock method of preparing oysters for shucking, as carried out in South Carolina, is based upon the premise that immersing the oyster in hot water at a given temperature for a definite period of time, followed by immediate chill down, will result in a product that is easier to open but one that may be approved by the Cooperative Program. The results of this study indicated that certain changes due to the process may be expected to occur in the bacteriological indices used as a measure of the sanitary quality of shellfish. The effect of the heat-shock process was a reduction in the density of the bacterial indices measured. This reduction was evident both in the over-all mean values for the indices from the before immersion stage of the process to the after immersion and shucking bench stages of the process and also in the mean ratios of the bacterial indices at the various stages in the process on a traced lot basis.

Thirty-two lots of shellfish meats and process waters collected at various stages of the commercial process were examined.

The bacterial content of the immersion waters was found to be consistently low. Viable coliform organisms were recovered in only 2 of 31 samples tested. Viable fecal coliforms were recovered in only 1 of the 31 samples. The 35°C. plate count ranged from 5 to 3000 organisms per milliliter with a median value of 120 organisms per milliliter.

Variations in the densities of the selected bacterial indices at three stages of the heat-shock process are summarized in Table 1.

Values listed at the three percentile levels were derived from the probability plots with no attempt at traced lot analysis. The heat-shock process resulted in an over-all reduction in the coliform and fecal coliform MPNs at all percentile levels. The greatest reduction occurred in the samples examined immediately after shocking. Holding on the shucking bench appears to result in a slight increase in these two groups of bacterial indices as compared to oysters examined immediately after shocking, however, these levels remain significantly lower than the levels obtained from samples from the cold shucking process.

The 35°C. plate count showed a slight decrease at the 25 and 50 percentile levels both in oysters immediately after shocking and in shocked oysters held on the shucking bench. At the 90 percentile level the plate count of the oysters immediately after shocking was comparable to the count obtained from cold shucked oysters. At this percentile level counts from shocked oysters held on the shucking bench were slightly higher than counts obtained from cold shucked oysters or oysters examined immediately after shocking.

The average percent change in coliform and fecal coliform densities examined on a traced lot basis is shown in Table 2. In most instances the shocking process resulted in a reduction in the coliform and fecal coliform MPNs of the shocked oyster meats. A comparison of oysters examined immediately after shocking to cold shucked oysters indicates a reduction in coliform and fecal coliforms of 50 percent and 25 percent, respectively. A comparison of shocked oysters held on the shucking bench with oysters examined immediately after shocking indicated a 40 percent increase in coliform MPN and a 10 percent increase in fecal coliform MPN. A comparison of shocked oysters held on the shucking bench with cold shucked oysters shows a 47 percent reduction in coliform MPN and a 17 percent reduction in fecal coliform MPN of the shocked oysters over the cold shucked oysters.

In 87 percent of the lots of shocked oysters tested immediately, the shocked oysters showed a decrease or no increase in coliform density when compared to cold shucked oysters. In 72 percent of the lots tested, the shocked oysters showed a decrease or no increase in fecal coliform densities.

Table 1. Densities of Selected Bacterial Indices at Three Stages of Processing of Oyster Meats - Field Study

	Cold Shucking Process			Shock Process					
				Immediately After Shocking			Shucking Bench		
	MPN/100g		35°C. Plate Count/g	MPN/100g		35°C. Plate Count/g	MPN/100g		35°C. Plate Count/g
Percent Occurrence	Coliform	Fecal Coliform		Coliform	Fecal Coliform		Coliform	Fecal Coliform	
25	370	21	1,100	130	8	700	150	11	760
50	900	84	1,800	330	29	1,300	430	45	1,600
90	4,800	1,100	4,600	1,900	350	4,500	3,100	680	6,000

Table 2. Changes in Coliform and Fecal Coliform Densities During Processing on a Traced Lot Basis - Field Study

	Heat Shock Process		Shucking Process		Over-all Process	
	Coliform	Fecal Coliform	Coliform	Fecal Coliform	Coliform	Fecal Coliform
No. of lots tested	30	28	32	30	30	31
Percentage of lots showing:						
(a) No change	20	11	12	20	20	23
(b) Density decrease	67	61	41	23	60	48
(c) Density increase	13	28	47	57	20	29
Average Percent Change	-50	-25	+40	+10	-47	-17

In a comparison of the shocked oysters examined immediately with shocked oysters held on the shucking bench, 53 percent of the lots tested showed a decrease or no increase in coliform MPN, however, in the remaining 47 percent of the lots there was an increase in coliform MPN. On the same basis of comparison, 43 percent of the lots showed a decrease or no increase in fecal coliform MPN, and 57 percent of the lots showed an increase in fecal coliform density.

In a comparison of shocked oysters held on the shucking bench with cold shucked oysters, 80 percent of the lots tested showed a decrease or no increase in coliform MPN with 20 percent of the lots showing an increase. With respect to fecal coliform MPN, 71 percent of the lots tested showed a decrease or no increase and 29 percent of the lots showed an increase.

The laboratory investigations conducted to determine the influence or the heat shocking process on the bacteriological parameters consistently resulted in reductions in coliform MPNs, fecal coliform MPNs and 35°C. plate counts on both Alabama and South Carolina oysters.

A comparison of results (Table 3) shows that the percent reduction in the selected bacterial parameters was significantly higher in the South Carolina oysters. This difference in bacterial reduction appears to correlate with the heat penetration differential determined in the oysters from the two sources. The average internal temperature of the South Carolina oysters at the end of three minutes immersion was found to be higher than the Alabama oysters immersed for an identical interval.

Table 3. Comparative Reduction in Selected Bacterial Parameters in Alabama and South Carolina Oysters Immersed Three Minutes at 150°F.

Sample Source	Percent Reduction (1) MPN/100g Coliform	Fecal Coliform	Plate Count/g 35°C.
Ala. Oyster	82.8	79.6	75.0
S.C. Oyster	97.8	83.0	99.4

(1) Based on the average of six determinations.

The results of the studies conducted by the cooperative field investigation team and by the Research Center at Dauphin Island of the heat-shock method of preparation of oysters for shucking show that a definite trend exists in a quantitative reduction in the parameters which are normally used in assessing the bacterial quality of shellfish. The method does not cause an increase and, therefore, the method should be approved on an interim basis for acceptance in the Cooperative Program.

APPENDIX V

ECONOMIC AND CONSERVATION ASPECTS OF THE COOPERATIVE STUDY OF THE "SHOCK" IMMERSION OR "HOT DIP" PROCESS IN COMMERCIAL HANDLING OF SHELLFISH IN SOUTH CAROLINA

By

Somers B. Pringle
Shellfish Section
South Carolina State Board of Health
Beaufort, South Carolina

In order to evaluate another side of the total picture relating to the shock method of opening cluster oysters, a study was carried out on the economic and conservation aspects of the program. (Questionnaire form is included as South Carolina Plate 1, see attachment.)

Three shock method plants of variable sizes were studied production wise in ratio to bushels purchased, price, yield and loss to the shell pile. A fourth plant was added to the program, a plant that operates both the cold crack operation of shucking, as well as the steamed canned process. The use of Plant No. 4 was decided on the factor that waste shell from the raw operation was shunted to the steam process section. In this plant we could get an exact idea of the volume of shellstock and/or oyster meat that would normally find its way to the shell pile (see Table 1).

Under average operation, a South Carolina bushel of cluster oysters will yield from 32 to 38 ounces of steamed oyster meat, shucked via the mechanical shaker method and brine sluiced to the packing room where the meat is washed and extraneous material is removed. Using the shellstock bypassed from the fresh shuck area and processing under the above procedure, from 12 to 15 ounces of steamed meat were recovered.

Further, a rough survey was made of several shell piles adjacent to oyster plants, to try to estimate losses to the shell pile. Observations were recorded from 25% to 31% volume wise on estimated measurements. Gross error could be allowed here, nevertheless, the loss appeared appalling. Some of this was alleviated by some operators planting the waste shellstock back on the bed during the next low tide period. So from the economic phase of purchase of raw shellstock ranging from $1.25 to $2.00 per bushels, plus the conservation phase of utilizing a product that would be lost to both industry income as well as loss of natural resources, the figures of loss from 1% to 5% volume wise in the shock industry standout as important, from all viewpoints.

SUMMARY

From the data gained and accumulated by the Cooperative Study of the "Shock" Immersion or "Hot Dip" Process in Commercial Handling of Shellfish in South Carolina, I quote now from paragraph 3, page 2, paragraph 4, page 24, and paragraph 4, page 26, respectively:

> Paragraph 3, page 2: As a result of these studies, it would appear that the "shock" method should be approved for acceptance in the Cooperative Program on the same basis as the cold shucking method.
>
> Paragraph 4, page 24: The "shock" method of opening oysters as indicated by the results of these studies shows that the method does not show an increase in the parameters normally used in assessing the quality of market shellfish.

Paragraph 4, page 26: The use of 145°F. to 150°F. dipping for a period of 2 to 3 minutes plus or minus 30 seconds, with an immediate chill down after removal from the "shock" water, as a method of opening oysters, appears to offer no immediate public health problems over normal cold shucking methods. This is substantiated by the studies discussed at the 1961 Workshop, the economic and conservation aspects as presented, and the present research project. It should be deemed that the process as conducted in South Carolina be included in the Manual of Operation of the Shellfish Program, as merely another process or method of shucking oysters for market purposes. These aspects of the program such as using potable ice in the shucking bucket while on the bench to inhibit bacterial increase, will be put into effect along with iced, chilled water at the skimmer. These segments of the program are normal to any cold shucking operation.

FINALLY

South Carolina wishes to reiterate that we are not attempting to sell any State, country or the industry on this method of shucking, but merely wish acceptance of our product as produced and further offer to any or all interested parties, any and all information and experiences we have accumulated over the years, if anyone is interested.

ACKNOWLEDGEMENTS

Dr. G. S. T. Peeples, State Health Officer, South Carolina State Board of Health and Mr. W. T. Linton, Director, Division of Sanitary Engineering, wish me to gratefully acknowledge the valuable contributions to the South Carolina State Board of Health and to the shellfish industry rendered by Mr. F. J. Silva, Shellfish Consultant, acting as liaison between the Public Health Service and the South Carolina State Board of Health. To Mr. Richard J. Hammerstrom and his efficient staff for the research program and compilation of the report which is of great magnitude and scope, and to Mr. C. B. Kelly for review and counsel with special acknowledgement to Mr. Martin Walsh, who braved the wilds of South Carolina and endured winter hardships and long hours of duty. Also Dr. Peeples wishes further to acknowledge the compliment to South Carolina State Board of Health by the Public Health Service in selecting a member of his staff to present the research report at the Workshop meeting in Washington, D.C., November 17-19, 1964.

SOUTH CAROLINA PLATE NO. 1

SHELLFISH SECTION
S. C. STATE BOARD OF HEALTH
BEAUFORT, SOUTH CAROLINA

QUESTIONNAIRE -- On production and yield information on the "Shock" or "Hot Dip" method of opening oysters - Please answer the following questions approximately as near as possible.

Type I. Cost per bushel of cluster type oysters used in plant. ________________

Type II. Cost of graded oysters used in plant (if bought from a Shellstock Dealer) or clusters graded by oyster picker in boat or at bed ________________

3. Yield in pints on type one - per bushel ________________

4. Yield in pints on type two - per bushel ________________

5. Approximate percentage of type one - oysters NOT shucked and thrown on shell pile. ________________

6. Approximate percentage of type two - oysters NOT shucked and thrown on shell pile. ________________

7. Approximate number of bushels of all types of oysters passed through the plant from September to present date. ________________

   "NO NAMES WILL BE USED IN COMPILING THESE FIGURES AS PLANTS WILL BE CALLED PLANT A OR B OR C, IN THE REPORT."

8. Approximate number of pints shucked from all types of oysters from September to present date. ________________

9. Temperature of Hot Dip Water. ________________

10. Length of time oysters in Hot Dip on an average. ________________

11. Do you use a hose and cool oysters after being in Hot Dip BEFORE putting them on the bench to be shucked. ________________

12. Do you use cold water (iced or pipe line in ice) to wash oysters on skimmer. ________________

13. What is the temperature of the water on skimmer - if you use cooled water, please check this for us. ________________

14. Do you ship or sell your oysters out of the State - if you do - what State or States. ________________

15. Do you sell in South Carolina as well. ________________

16. Do you find that you can sell the same customers over and over again. This means the public likes your oysters. ________________

RETURN TO SOMERS B. PRINGLE.

Table 1. Economic Phases of "Shock" Shucking

SHELLSTOCK TYPE I (As picked off oyster bed)

SHELLSTOCK TYPE II (Some removal of dead shell)

PLANT "A"

Average cost of Type II cluster oysters per bushel	$	2.00
Average loss to shellpile		1%
Production during period 9/15/63 - 2/1/64	bushels	1,300
Yield	pints	6,136
Average yield per bushel	pints	4.72

* * * * * * * * * * *

PLANT "B"

Average cost of Type I cluster per bushel	$	1.25
Average cost Type II		1.90
Average loss to shellpile Type I		10%
Average loss to shellpile Type II		5%
Production during period 9/15/63 - 2/1/64	bushels	20,000
Yield	pints	85,000
Yield per bushel Type I	pints	4-4.5
Type II	pints	5-5.4
Overall yield per bushel	pints	4.3

* * * * * * * * * * *

PLANT "C"

Average cost Type I cluster oysters per bushel	$	1.25
Average loss to shellpile		5%
Production during period 9/15/63 - 2/1/64	bushels	1,676
Yield as reported	gallons	1,438
Yield as reported converted to pints	pints	11,504

APPENDIX V

HEAT SHOCK METHOD OF PREPARATION OF OYSTERS FOR SHUCKING

APPENDIX D

Presented By

Somers B. Pringle
Shellfish Section
South Carolina State Board of Health
Beaufort, South Carolina

The Eastern oyster *Crassostrea virginica* in one State is found in clusters which prevents rapid or conventional shucking as with the same species in other oyster growing areas. This natural phenomenon has presented questions as to how best this natural resource might be utilized as a food source and remain within economic possibilities.

Dr. A. D. Tennant[1] in Canada investigated the short term dipping of soft shell clams in near boiling water for various periods of 3 to 30 seconds. It was reported that this short term heat shock resulted in a reduction of coliform and fecal streptococci numbers. The reduction obtained after 3 to 10 seconds immersion was not significantly less than that recorded after longer periods of heat treatment with the animals still alive after the immersion. There was no significant increase in the MPN values in "shocked" clam meats during seven day refrigeration periods, and the short period of immersion did not impair the keeping qualities of the packed, refrigerated clam meats. The "shocking" process also reduced the amount of surface contamination carried to the shucking tables by the shell stock and facilitated shucking without effecting the palatability of the product.

It has further been found that immersing the cluster type oyster in comparatively hot water (145°-150°F.) for a short period of time (up to three and one-half minutes) facilitates the removal of oyster meat up to 99 percent of that contained in the cluster. This process has been investigated under a cooperative project by the Public Health Service and the South Carolina State Board of Health[2]. The "heat shock" process resulted in an overall reduction in the coliform and fecal coliform MPN's at all percentile levels. The greatest redoction occurred in the samples examined immediately after shocking. Holding on the shucking bench appears to result in a slight increase in these two groups of bacterial indices as compared to oysters examined immediately after shocking; however, these levels remain significantly lower than the levels obtained on samples from the cold shucking process. Accordingly, it has been concluded that with application of sanitary precautions the beneficial use of this food source may be fully realized.

The following sanitary measures are delineated for use where the "heat shock" method of preparation of oysters for shucking is permitted by State shellfish sanitation authorities. These are intended to apply only to the cluster type oyster, but may be adaptable in other areas:

---

[1] Tennant, A. D. "An Investigation of the Bacterial Flora of the Soft Shell Clam *Mya arenaria* in New Brunswick and Nova Scotia." Master of Science Thesis, McGill University, Montreal. Abstract available from Shellfish Sanitation Branch, Division of Environmental Engineering and Food Protection, Public Health Service, Department of Health, Education, and Welfare, Washington, D.C. 20201.

[2] Russell, Ralph T., Hammerstrom, Richard J., Pringle, Somers B., and Walsh, Martin, "Studies of the 'Heat Shock' Process for Oysters." See Proceedings Shellfish Sanitation Workshop, November 17-19, 1964.

1. Washing of Shell Stock.--Shell stock subjected to the heat shock process shall be washed immediately prior to the heat shock operation in potable water. Experience has shown that wash water temperatures between 65°F. and 75°F. is effective for adequately washing shell stock. Shell stock shall be protected from contamination prior to and during the pre-wash cycle.

Public-health explanation.--Although Item 2 of Section A requires that shell stock be washed reasonably free of bottom sediments and detritus as soon after harvesting as is practicable, it is necessary to again wash shell stock immediately prior to heat shocking to reduce the bacterial load in the dipping tank. Invariably some mud or detritus will adhere to the shell stock; hence, the necessity to again wash the shell stock before it is immersed in the heat shock water where the mud or detritus may be released by the warmer water. The cleaner the shell stock, the more rapidly the oysters will arrive at the optimum temperature for shucking and there will be less variation in the heat transfer among different lots.

Satisfactory compliance.--This item will be satisfied when:

a. All shell stock subjected to the heat shock process are washed immediately prior to the heat shock operation in flowing potable water. Water temperatures not less than 65°F. nor more than 75°F. are recommended.

b. Shell stock are handled in a manner which prevents their contamination during the pre-wash cycle.

2. Temperature and Change of Dip Water.--During the heat shock process the water shall be maintained at not less than 145°F. or more than 150°F. The water shall be completely drained or removed from the heat shock tank after each three hour period. An accurate [3] indicating or recording thermometer shall be available and used during the heat shock process for temperature measurements. Recording thermometers are recommended so as to provide a record of the temperatures used.

Public-health explanation.--Experience and research indicates the temperature range of 145°- 150°F. to be adequate to facilitate removal of oysters from the shell without apparent physical change or damage to the oyster. A temperature range is specified rather than an exact temperature because of varying climatic conditions during the year. Dip water is required to be changed every three hours to avoid bacterial concentration or buildup of mud or detritus.

Satisfactory compliance.--This item will be satisfied when:

a. Heat shock water is maintained at not less than 145°F. or more than 150°F.

b. The heat shock water tank is completely flushed at three hour intervals or less in such manner that all mud and detritus remaining in the dip tank from previous dippings are eliminated.

c. An indicating or recording thermometer, accurate within two degrees between 145°F. and 150°F. is available and is located in the heat shock water during all periods of shock operation.

3. Time Interval of Immersion.--Shell stock subjected to the heat shock process shall not be immersed in the heat shock water for periods longer than 3.5 minutes. An accurate timing device shall be available and used to control the time of immersion. Only approved containers of one-half bushel [4] capacity shall be used in the heat shock process. It is recommended that an automatic timer or an automatically, electrically controlled timer be used.

---

[3] Thermometers should be accurate to within 2°F.; should have scale divisions not greater than 2°F.; and should be so installed as to be easily read. Accuracy of thermometer should be checked at least once each year by the State regulatory agency.

[4] Defined as 1,075.2 cubic inches or as one-half the U.S. standard bushel of 2,150.4 cubic inches.

Public-health explanation.--Industry practice and investigation reveals than an immersion time varying between two and three minutes, plus or minus 30 seconds, is all that is necessary to facilitate the shucking process. A maximum time of immersion is specified to prevent any physical or biological change in the oyster which would prevent it from being classified as a fresh product. The maximum time specified is based on the use of one-half bushel quantities of shell stock in one-half bushel wire baskets or other one-half bushel containers approved by the shellfish sanitation control agency.

Satisfactory compliance.--This item will be satisfied when:

a. Shell stock is not subjected to the heat shock process for periods longer than three and one-half minutes.

b. An accurate timing device is available and used to control the time of immersion.

c. Only approved containers of one-half bushel capacity are used during the heat shock process.

4. Dip Tank Volume.--At least eight gallons of heat shock water shall be maintained in the dip tank for each one-half bushel container of shell stock being heat shocked.

Public-health explanation.--The minimum of eight gallons of dip water per one-half bushel is necessary to prevent bacterial buildup and extreme variations of temperature in the heat shock water.

Satisfactory compliance.--This item will be satisfied when there are at least eight gallons of heat shock water in the heat shock tank for each one-half bushel container of shell stock undergoing the heat shock process.

5. Cooling of Heat Shocked Shell Stock.--On removal from the shock immersion water, all heat shocked shell stock shall be subjected to an immediate cool down with potable tap water. Heat shocked shell stock shall be handled in a manner which prevents contamination reaching the shell stock during the cooling operation.

Public-health explanation.--After undergoing the heat shock process, the internal temperature of the oyster meat may be elevated to temperatures within a range of 98°F. to 110°F. It is therefore necessary to reduce the internal temperature of the oyster meat immediately to prevent bacterial growth, but not to the extent that the purpose of the process is nullified.

Satisfactory compliance.--This item will be satisfied when:

a. All heat shocked shell stock are subjected to cooling with potable tap water immediately upon removal from heat shock process water.

b. All heat shocked shell stock are handled in such manner as to preclude contamination during the cooling process.

6. Refrigeration of Shocked Shucked Shellfish.--The oyster meats from all shell stock which have been subjected to the heat shock process shall be cooled to an internal temperature of 45°F. within two hours after the heat shocking process.

Public-health explanation.--Oyster meat temperatures of shell stock which have been subjected to the heat shock process are higher than those of conventionally shucked oysters. Therefore, it is necessary that such meats be cooled quickly to 45°F. after the heat shock process to deter bacterial growth.

Satisfactory compliance.--This item will be satisfied when all oyster meats of shell stock which have been subjected to the heat shock process are cooled to at least 45°F. within two hours after the heat shock process and are placed in storage at 40°F. or below. (This requirement will require the use of ice in the shucking containers, blowers, skimming tables, or wash tanks, or the use of refrigerated water, wherein the meats will be in direct contact with crushed or flaked ice, or with refrigerated water.)

7. Records of Heat Shock Time and Temperatures.--Each plant operating the heat shock process shall maintain an accurate daily record, on a ledger form satisfactory to the State supervisory agency, of the time and temperature of immersion of at least three lots of shellfish during each day of operation, as well as recording the time of change of heat shock water. It is preferable that records show the time of day each recorded lot is immersed and the time of day each recorded lot is removed from the water, and that the individual recordings be at intervals of 2 or 3 hours. These records shall be preserved for at least 3 months for the information of the supervising State agency.

Public-health explanation.--Records are needed to maintain a summary or abbreviated history of each hot dip operation. They are of assistance to the supervisory agency in determining whether the operation is carried out in accordance with these or other State regulations covering the process. They are also of assistance to the operator in maintaining the process within the limitations imposed by State authorities.

Satisfactory compliance.--This item will be satisfied when:

a. Each operator maintains an accurate daily record of the time and temperature of immersion of at least three lots of shellfish during the day of operation and records the time of change of heat shock water. This record shall be on ledger forms satisfactory to the State supervisory agency. (Plants using recording tharmometers will be deemed in compliance with this item if suitable indication is made on the chart when the shell stock are first immersed and when they are removed from the heat shock water, as well as the time of change of heat shock water.)

b. The above records are preserved and are on file at the plant for inspection by State authorities.

8. Cleaning and Bactericidal Treatment of Heat Shock Process Tank.--At the close of each day's operation the heat shock tank shall be completely emptied of all water, mud, and detritus, and shall be cleaned in accordance with the requirements for cleaning of equipment established by item 16, Section B, Part II. Prior to the start of the next day's operation, the heat shock tank shall be given bactericidal treatment in accordance with the requirements of item 17, Section B, Part II. Heat shock process tanks shall be of such construction that they may be easily cleaned.

Public-health explanation.--If the water, mud, and detritus were allowed to remain in the heat shock tank under declining temperature conditions, it would constitute an excellent medium for growth of bacteria. Emptying the tank and cleaning it at the close of the day's operation will more likely ensure that the next day's dipping operation will start under optimum conditions of cleanliness. Bactericidal treatment prior to the start of the next days' operation will ensure destruction of any pathogenic bacteria remaining after the cleaning operation or introduced during the interim storage period. It will also prevent carry-over of thermophilic or themoduric bacteria from the previous day's operation.

Satisfactory compliance.--This item will be satisfied when:

a. The heat shock process tank is thoroughly cleaned at the close of each day's operation in accordance with the requirements for cleaning of equipment established by item 16, Section B, Part II.

b. The heat shock process tank is flushed with water from an approved source after cleaning and is allowed to drain and dry overnight.

c. Bactericidal treatment complying with the requirements of item 17, Section B, Part II, is provided to the heat shock tank prior to the start of the day's dipping operation.

d. All heat shock process tanks are of such construction that they may be easily cleaned.

APPENDIX W

FOREWORD

A DECLARATION OF PRINCIPLES

By

Eugene T. Jensen
Shellfish Sanitation Branch
Public Health Service

The National Shellfish Sanitation Program is an unusual teaming of State and Federal resources to preserve and manage a natural resource for a beneficial use.[1] Although the current program is of comparatively recent origin, its development can be traced back through several centuries of American history.[1] When the European colonists arrived they found almost unimagined natural wealth. Forest, rich agricultural land, minerals and space itself were present in quantities and a variety previously unknown. To these settlers one of the most valuable and readily useable of these natural resources was the food resources of the sea, particularly the estuaries. It is not surprising that shellfish were foremost among their staple food items.

The value of these renewable natural resources to the early settlers was reflected in colonial legislation designed to encourage their wise use. In 1658--over three hundred years ago--the Dutch council of New Amsterdam passed an ordinance regulating the taking of oysters from the East River. Other early legislation, including that of New York (1715), New Jersey (1730) and Rhode Island (1734), was designed to regulate harvesting, presumably as conservative measures to guarantee a continuing supply.

The public health problems which were associated with shellfish in the United States in the first two decades of the present century brought a new dimension to natural resource utilization; i.e., shellfish could not be used for food unless of acceptable sanitary quality. This concept was clearly recognized in the PHS-sponsored conference of 1925 in which the concepts of the present Cooperative Program were first outlined and the administrative foundation put down. All parties seemed to recognize, and accept as fact, the premises that: 1) shellfish represented a valuable natural food resource, 2) the cultivation, harvesting and marketing of this food resource were valuable components in the financial bases of many coastal communities, 3) a State and Federal program was necessary to permit the safe use of this resource, and 4) the transmission of disease by shellfish was preventable and therefore not to be tolerated. It is significant that the founders of this program did not take the parochial stand that the only completely safe way to prevent disease transmission by shellfish was to prohibit its use. Instead, they held that this beneficial use of the estuaries was in the best public interest, and that sanitary controls should be developed and maintained which would allow safe use. These concepts were recognized in the program which evolved following the report of the "Committee on Sanitary Control of the Shellfish Industry in the United States" in 1925.

In 1954 the Surgeon General of the United States Public Health Service called a second National conference to discuss shellfish sanitation problems. Specifically, the 1954 conference addressed itself to the questions of the practicality and need for this tripartite program. There was general agreement that, despite the profusion of technical problems, the basic concepts were sound and that it was in the public interest to maintain the program. Thus, the presence of an irrevocable bond between the application of sanitary controls in the shellfish industry and the continuing beneficial use of a renewable natural resource was again confirmed.

Despite this long-established relationship, the National program has tended to neglect the second of these biphasic goals--use of a valuable natural resource--and to concentrate on the negative policy of closure of areas of unsuitable sanitary quality. Little effort has been made by the program to develop a compensatory element which would encourage corrective action by State or Federal agencies. Similarly, the program has not taken a position on the use of conservation law even when it was known that this would increase the programs consumer protection confidence factor.

In recognition of past history of the shellfish industry in the United States and of the relationship of the National Shellfish Sanitation Program to the effective use of this natural resource, the 1964 Shellfish Sanitation Workshop endorses the following principles:

1) Shellfish are a renewable, manageable natural resource of significant economical value to many coastal communities, and which should be treated as are other natural resources such as forest, water and agricultural lands.

2) Shellfish culture and harvesting represents a beneficial use of water in the estuaries. This use should be recognized by State and Federal agencies in planning and carrying out pollution prevention and abatement programs and in comprehensive planning for the use of these areas.

3) The goals of the National Shellfish Sanitation Program are: 1) the continued safe use of this natural resource and 2) active encouragement of water quality programs which will preserve all possible coastal areas for this beneficial use.

It is the conviction of the 1964 National Shellfish Sanitation Workshop that survival of the shellfish industry is in the best public interest; that by application of the above principles on a State-by-State basis shellfish can continue to be used safely as food and to make a valuable contribution to the economic structure of the Nation, both in the immediate present and in the foreseeable future.

SUGGESTED CHANGES IN THE MANUAL OF RECOMMENDED PRACTICE FOR THE SANITARY CONTROL OF THE SHELLFISH INDUSTRY

By

Leroy S. Houser
Shellfish Sanitation Branch
Public Health Service

APPENDIX X

The agreed-upon standards of the Cooperative Program for the Certification of Interstate Shellfish Shippers have been continuously revised since the beginning of the program in 1925 to meet changing conditions. The first Manual used by the program was entitled U.S. Public Health Service Minimum Requirements for Endorsement of State Shellfish Control Measures and Certification for Shippers in Interstate Commerce. The experience gained by the shellfish industry, States, and the Public Health Service in applying these minimum requirements made it possible for the Cooperative Program to prepare and adopt, in 1946, a subsequent Manual entitled Manual of Recommended Practice for Sanitary Control of the Shellfish Industry.

The 1946 Manual was later rewritten in two parts: Part I, Sanitation of Shellfish Growing Areas was published in 1959, and Part II, Sanitation of the Harvesting and Processing of Shellfish was published in 1957. Both parts reflected the changes taking place in the industry and in public-health techniques and advances.

The 1961 Shellfish Sanitation Workshop recommended further changes in Parts I and II. These were incorporated in a revision which was published in 1962. Our experiences with the 1962 revision have suggested the need for further additional revisions. It is essential, of course, that these Manuals be kept up to date in order that the Cooperative Program will continually reflect new technical, epidemiological or administrative developments. We therefore propose the following changes which have been received from many sources including industry, the State control agencies and the several regional conferences with State shellfish personnel as well as individual meetings with industry groups. Each suggested change has been carefully evaluated and recommended actions are indicated in the following item-by-item listing of proposed changes. It is suggested that each change be discussed and that agreement be reached on a suitable course of action.

PART I

Sanitation of Shellfish Growing Areas

1. Suggested Change, Definition of the Word "Shellfish" in Parts I and II of the Manual: The definition of "shellfish" differs in Parts I and II of the Manual, and they should be identical.

   The definition in Part I is presently stated as follows:

   > Shellfish.--All edible species of oysters, clams, or mussels. Shellfish products which contain any material other than the meats and/or shell liquor of oysters, clams, or mussels will be regarded as a "processed food" and will not be included in the Cooperative Program.

   The definition in Part II is presently worded as follows:

   > Shellfish.--All edible species of oysters, clams, or mussels, either shucked or in the shell, fresh or frozen. (For the purpose of this Manual, the term does not include crabs, shrimp, or lobsters.)

   Discussion: We propose to simplify the definition as follows as the previous inclusion of references to processed food and to crabs, shrimp, or lobsters appears to unduly complicate the definition.

Shellfish.--All edible species of oysters, clams, or mussels, either shucked or in the shell, fresh or frozen.

Recommendation: That the Workshop endorse the above proposed definition of shellfish.

2. Suggested Change, Page 4, Section A, "Satisfactory Compliance," Sub-item (a) of Item 1: That the first sentence of sub-item (a) be changed to read:

   a. Classify all actual or potential shellfish growing areas as to their suitability for shellfish harvesting on the basis of sanitary quality as defined in Section C of this Manual, and to make compensatory changes in the related Public-Health Explanation and Satisfactory Compliance portions of the item as well as other items which contain similar wording and intent.

   Discussion: It has been pointed out by several States that it should not be necessary to classify waters which for biological reasons will not support shellfish production. Accordingly, the above suggested change requires classification of actual or potential shellfish growing areas rather than all coastal waters.

   Recommendation: That the Workshop endorse the above change.

3. Suggested Change, Page 6, Section A, Item 2, Sub-item (e) of "Satisfactory Compliance": That the words "and inspection" be deleted from sub-item (e). This sub-item would then read as follows:

   e. The following records are kept of shellfish sanitation activities as required in Sections C, D, & E, Part I of this Manual, and when monthly summaries of State patrol activities are forwarded to the Public Health Service Regional Office.

   Discussion: The monthly summaries of plant inspections forwarded by the States to the PHS Regional Offices have not been useful.

   Recommendation: That the Workshop endorse the above revision.

4. Suggested Change, Page 9, Section C, Item 1, Sub-item (a) of "Satisfactory Compliance": That the word "pesticides" be inserted after the word "wastes" in the second sentence of sub-item (a) which would then be changed to read as follows:

   A comprehensive sanitary survey shall include evaluation of all sources of actual or potential pollution on the estuary and its tributaries, and the distance of such sources from the growing areas; effectiveness and reliability of sewage treatment works; the presence of industrial wastes, pesticides, or radionuclides which would cause a public-health hazard to the consumer of the shellfish; and the effect of wind, stream flow, and tidal currents in distributing polluting materials over the growing areas.

   Discussion: The increased use of herbicides, insecticides, and other chemicals for predator control, constitutes a potential hazard to shellfish growing waters which regulatory authorities have to consider in conducting sanitary surveys of growing areas. It is necessary that the word "pesticides" be included in this sentence to provide Manual coverage of the practice.

   Recommendation: That the word "pesticides" be inserted in the above section.

Identification Proposal

5. Suggested Change, Page 9, Section C, Item 1: That a new sub-item (d) be inserted after sub-item (c) which would be worded as follows:

d. The State agency having primary responsibility for this element of the Cooperative Program develops a system for identification of growing areas.

Discussion: Experience has indicated that it is highly desirable that records and tags should contain information as to the growing area source of shell stock. The first step in attaining this achievement is for each State to develop a growing area identification system.

Recommendation: That the Workshop endorse the addition of the above sub-item to Section C, Item 1, page 9.

6. Suggested Change, Page 11, Section C, Last Sentence of Item 1: That the words "within one year" be inserted between the word "made" and the word "if" in the last sentence of Item 1, page 11. Further, that the word "detrimental" be inserted between the words "significant" and "change."

> A resurvey should be made within one year if the reappraisal shows a significant detrimental change.

Discussion: The present wording indicates a resurvey should be made if the reappraisal shows a significant change, but does not indicate any time element. It is our belief that a year's time should be established for a resurvey if one is indicated to be necessary by the reappraisal.

Recommendation: That the Workshop endorse the above insertion of the words "within one year" and the word "detrimental" in the last sentence of item 1.

7. Suggested Change, Page 11, Section C, Item 2: That a footnote be added to item 2 indicating that some States may wish to use other terms in describing classification of areas. Accordingly the following wording for the footnote is proposed:

> * States may use other terms or terminology in describing area classifications; provided, that the classification terms used are consistent with the intent and meaning of the words "approved," "conditionally approved," "restricted," or "prohibited."

Discussion: One State has indicated they do not like the term "conditionally approved areas." We have no objection to any State using other terms in describing the classification in sub-item (a).

Recommendation: That the Workshop endorse the above footnote.

8. Suggested Change, Page 13, Section C, Item 3: That the word "pesticides" be inserted after the word "radionuclides" in the first paragraph of this item. Further, that the words "whenever the sanitary survey indicates the need" be substituted for the words "insofar as possible" in the next to last line of the paragraph. The first paragraph would then read:

> 3. Approved Areas.--Growing areas may be designated as approved when: (a) the sanitary survey indicates that pathogenic micro-organisms, radionuclides, pesticides, and/or harmful industrial wastes do not reach the area in dangerous concentration, and (b) this is verified by laboratory findings whenever the sanitary survey indicates the need. Shellfish may be taken from such areas for direct marketing.

Discussion: The increased use of herbicides, insecticides and other chemicals has been discussed in the previously recommended change Number 4; consequently, this change is necessary as a follow-up on the previous recommendation. It is thought the words "whenever the sanitary survey indicates the need" is more definitive than the words "insofar as possible." Compensatory changes will be necessary in sub-item (b) of the satisfactory compliance portion.

Recommendation: That the Workshop endorse the above additions.

9. Suggested Change, Page 13, Section C, Item 3: That the word "or" be inserted at the end of sub-item (c) and a new paragraph "d." be inserted after the present sub-item (c) in accordance with Mr. Beck's proposal.

(Refer to Mr. William J. Beck's paper on Bacteriological Criteria for Shellfish Growing Waters for consideration of the proposal regarding an alternate bacteriological standard for growing waters.)

10. Suggested Change, Page 18, the Heading, the First Sentence of Item 7, and Sub-item (a) of "Satisfactory Compliance" on Page 19: That the word "paralytic" be deleted from the item wherever it is presently used. The heading would be changed to read as follows:

7. Closure of Areas Due to Shellfish Toxins

The first sentence would be revised to read as follows:

> The State shellfish control agency shall regularly collect and assay representative samples of shellfish from growing areas where shellfish toxins are likely to occur.

Sub-item (a) of the Satisfactory Compliance portion on page 19 would be changed to read as follows:

> a. The State shellfish control agency collects and assays representative samples of shellfish for the presence of toxins from each suspected growing area during the harvesting season.

Discussion: The occurrence of toxins in Gulf State waters which may not be related to the "Paralytic Shellfish Poison" of Northeast waters or Pacific Coast waters indicates the need for a change in wording of this item so as to include all and any forms of toxins which may appear in shellfish growing waters.

Recommendation: That the proposed change be endorsed by the Workshop.

11. Suggested Change, Page 20, Section D, Item 1, Sub-item (b) of "Satisfactory Compliance": That the word "direct" in this sub-item be replaced by the word "continuous." This sentence would then read as follows:

> However, continuous supervision will not be necessary if relaying operations are carried out during a period when shellfish may not be marketed.

Discussion: It is desirable that all relaying operations be under the immediate supervision of the State shellfish control or patrol agency. However, it has been pointed out that where closed marketing seasons exist for some species in one State, they would have difficulty complying with this item if "direct supervision" were indicated, but could comply if the words "continuous supervision" were used.

Recommendation: That the Workshop endorse the above change.

12. Suggested Change, Page 20, Section D, Sub-item (c) of Item 1: That the wording of sub-item (c) be changed to read as follows:

> c. State permission to relay shellfish is given only to responsible persons; responsibility to be determined by the past record of the permit applicant.

The present wording of this sub-item is presented below:

> c. State permission to relay shellfish is given only to responsible persons, unless the entire operation is under direct supervision of the State. Responsibility shall, when possible, be determined by the past record of the permit applicant. It is recommended that applicants be required to post performance bonds.

Discussion: Deletion of the words "unless the entire operation is under direct supervision by the State" would require that all relaying operations to be under the direct supervision of the State, as it is believed this requirement is necessary to prevent illicit sale of shellfish during relaying operations. It is also believed the recommendation for a performance bond is presently unwarranted.

Recommendation: That the Workshop endorse the above change.

PART II

Sanitation of the Harvesting and Processing of Shellfish

1. Suggested Change, Page 3, Definitions: That a definition of the word "person" should be included in the definitions of Part II. The following wording for a proposed definition is suggested:

> Person.--Person shall mean an individual, or a firm, partnership, company, corporation, trustee, association, or any public or private entity.

Discussion: Although we do not have strong convictions that a definition of the word "person" is required in the Manual, we have no objection to its inclusion.

Recommendation: That the Workshop endorse the above definition of "person" for inclusion in the definitions of Part II.

2. Suggested Change, Page 4, Section A, Sub-item (a) of "Satisfactory Compliance": That the word "ordinarily" be deleted from the wording of sub-item (a). This sub-item is presently worded as follows:

> a. Decks and/or storage bins are so constructed and located as to prevent bilge water or polluted overboard water from coming into contact with shellfish. Removable false bottoms will ordinarily be required in all small craft, including rowboats, skiffs, and power boats used in the transport of shell stock.

Discussion: It is believed the inclusion of the word "ordinarily" in the above paragraph is unnecessary as it adds nothing to the sentence and appears to indicate there may be situations where bilge water or polluted water may be in contact with shellfish.

Recommendation: That the Workshop endorse the above change.

3. Suggested Change, Page 4, Section A, Item 1, Sub-item (e): Sub-item (e) is presently worded as follows:

> e. Decks and storage bins of boats used for transporting shellfish from polluted areas to approved areas for relaying are cleaned and are given bactericidal treatment before they are used for the transport of shellfish from approved areas.

It is proposed that the above wording be changed to read as follows:

> e. That portion of boats or trucks (decks, storage bins, floor beds, etc.) and all other equipment (shovels, wheelbarrows, rakes, etc.) in contact with shell stock during handling or transport from polluted areas to approved areas for relaying are thoroughly cleaned before they are used for the transport or handling of shellfish from approved areas.

Discussion: The sub-item does not now include trucks and other equipment. In addition, it is questionable as to the effectiveness of bactericidal treatment on wooden surfaces such as boat decks.

Recommendation: That the Workshop endorse the above change.

4. Suggested Change, Page 5, Item 3: That a recommendation be inserted as the last sentence of item 3 to the effect that the State should maintain an educational program for harvesters concerning the dangers inherent in overboard discharge of body excretions. The insertion would be worded as follows:

> It is recommended that each State shellfish control agency maintain an educational program for harvesters concerning the public health significance and dangers inherent in the overboard discharge of body excretions.

Discussion: The problem of waste disposal from boats has not been solved. It is believed more emphasis, particularly on education of harvesters, is warranted.

Recommendation: That the Workshop endorse the inclusion of the above recommendation.

Identification Proposal

5. Suggested Change, Page 5, Section A, Item 4: That a new item be inserted after item 3 which would be worded as follows:

> 4. Licenses for Commercial Harvesters.--Each person who handles unshucked shellfish prior to delivery or sale to a dealer certified under the Cooperative Program shall have a valid State permit or license to do so.
>
> In the case of leased land, either the lessee shall be licensed or the person which harvests shall be licensed by the State. The State agency having primary responsibility for granting licenses shall maintain a record of all such licenses granted for review by the appropriate Public Health Service Regional Office.

Satisfactory compliance.--This item will be satisfied when:

a. Each person harvesting shellfish has a valid permit or license to do so.

b. The State agency having responsibility for granting licenses maintains a record of all such licenses granted for review by the appropriate Public Health Service Regional Office.

c. In the case of leased growing area(s), either the lessee or the person who harvests shall be licensed by the State.

Discussion: This proposal is one of the identification proposals previously discussed with State agency personnel at regional and individual meetings. Licensing of harvesters provides a degree of control over their actions with respect to the Cooperative Program, which is not otherwise possible.

Recommendation: That the Workshop endorse the above addition to the Manual.

6. Suggested Change, Page 12, Section B, Item 14: That a new item j be added after sub-item (i) which would read as follows:

> j. All blower tanks, skimmers, returnable shipping containers, shucking buckets and pans purchased and/or installed after September 30, 1965, shall comply with the sanitation requirements contained in the Shellfish Industry Equipment Construction Guides published by the Public Health Service. (Copies are available from State shellfish sanitation agencies or Public Health Service Regional Offices.)

Discussion: The Shellfish Industry Equipment Construction Guides were adopted by the 1961 Shellfish Sanitation Workshop and were published in April 1962. Subsequently, their use has not produced the desired effect of up-grading the sanitation features of blowers, skimmers, etc., on new purchases. It is believed making their use mandatory on purchases after September 30, 1965, would gradually improve the sanitary features on such equipment in use. One State has suggested an effective date of September 30, 1966. We are agreeable to any effective date satisfactory to the Workshop.

Recommendation: That the Workshop endorse the above addition.

7. Suggested Change, Page 13, Section B, Item 16: That sub-item (e) be rewritten to include the word "bactericides" in the first sentence. The sub-item would then read as follows:

   e. Adequate cleanup facilities, including sinks, bactericides, detergents, and brushes are available within the plant.

Discussion: When this portion of the Manual was written the word "bactericides" was omitted.

Recommendation: That the Workshop endorse the above addition.

8. Suggested Change, Page 17, Section B, Item 21: That the Public-Health Reason and the Satisfactory Compliance of item 21 be changed to prohibit the return of overage (bluff) from the packing room to the shucker. The first sentence of the sixth paragraph of the Public-Health Reason would be changed as indicated in item 1 below and in item 2, a new sub-item (g) would be added to the Satisfactory Compliance portion which would be worded as stated in the following item 2, sub-item (g):

   1. The return of overage (bluff) from the packing room to the shucker would ordinarily result in at least a portion of the shellfish being held on the shucking bench for more than two hours, and would permit an undesirable growth of bacteria.

   2. g. The return of overage (bluff) from the packing room is not permitted.

Discussion: The return of overage from the packing room is considered an unnecessary practice which permits significant increases in the bacteriological content of the shucked shellfish and should be prohibited.

Recommendation: That the Workshop endorse the above change in item 21 of the Manual.

Identification Proposal

9. Suggested Change, Page 18, Section B, Item 24: That the last sentence of the first paragraph of item 24 which requires code dating of frozen shellfish be deleted and that a new paragraph be inserted after the first paragraph of item 24 which would be worded as follows, and that compensatory changes be included in the Satisfactory Compliance portion; i.e., sub-item (f):

   Each State shall establish a uniform code-dating system which shall be utilized by all shucker packers and repackers in that State to indicate the date of packing or repacking of all fresh and frozen shucked shellfish. (A recommended code-dating system is included in Appendix B, see attachment.)

Discussion: This proposed change has been discussed with the States and it is generally agreed that the code dating of shucked shellfish assists the regulatory agency in determining the age of the product and in tracing shellfish to their point of origin. Code dating is also needed to translate age of product into bacteriological results. However, there are divergent views among the States as to whether the code-dating system should be uniform statewide, and whether one gallon containers should be code dated.

Recommendation: That the Workshop endorse the above wording as presently constituted.

10. Suggested Change, Page 19, Section B, Item 25 "Refrigeration of Shucked Shellfish": That the Public-Health Reason for this include the following additional paragraphs:

> In addition, research by the Public Health Service with *Crassostrea virginica* and *Crassostrea gigas* stored in ice and at 37.5° F. sustained slight increases in coliform MPNs during the first five days of storage. After the storage period of five days, there was a continuous increase in MPN values until the 25th day, at which time the coliform MPNs exceeded the original values by at least 50 times. Oysters from the same lots stored at 50° F. sustained a continuous increase in coliform MPNs exceeding 1000 times the original count within five days.
>
> In the same studies oysters stored in ice and at 37.5° F. sustained only slight increases in standard plat counts after being stored for five days. However, with a storage temperature of 50° F. the same oysters sustained plate count increases which exceeded 180 times their original count within five days.
>
> The fecal coliform MPNs decreased slightly from their original MPN values during storage in ice, at 37.5° F. and at 50° F., with the exception that there was a frequent increase in fecal coliform MPNs at the 50° F. storage temperature. (See Time and Temperature Effects on Stored Oysters by C. B. Kelly, Proceedings 1964 Shellfish Sanitation Workshop, available from Shellfish Sanitation Branch, Public Health Service, Department of Health, Education, and Welfare, Washington D. C. 20201.) (Figures 1, 2, and 3 which present the above information as logrithmic plots will be included in Appendix B of the Manual.)
>
> It was concluded that to avoid adverse bacterial multiplication it is necessary to refrigerate shucked oysters immediately after shucking to 40° F. or lower.

Discussion: In previous proposals to the industry and the States it was recommended that this item be changed to require a refrigeration temperature of 40° F. or 45° F. Several States and some portions of the industry were opposed to this on the basis that it would create undue hardship.

Recommendation: That the Workshop endorse the above addition.

11. Suggested Change, Page 20, Section B, Item 27 "Records": That the Satisfactory Compliance portion of this item be changed to read as follows:

> Satisfactory compliance.--This item will be satisfied when each shucker-packer, repacker, shellstock shipper, or reshipper establishes and maintains a ledger record or record system satisfactory to the State control agency indicating from whom shellfish were purchased or secured; the date purchased or secured; State designated areas from which the shellfish were harvested; and the names and addresses of persons to whom shellfish were sold. Failure to establish and maintain adequate records shall result in refusal of State agencies to certify shucker-packers for interstate certification. (An example ledger form is contained in Appendix B, see attachment.)

Discussion: The only new requirement contained in the above which versus the present wording of the item is the establishment of a ledger record or record system separate from the financial records of the plant; the refusal of State agencies to certify plants for interstate sale; and that an example ledger form is contained in Appendix B (see attachment). In practice, reviewing financial records has proven to be a monumental task for investigators and has led to much uncertainty as to the areas and sources from which shellfish were obtained. It is believed that establishment of specific records concerning sources, area designations, dates, and sales would permit much quicker and more accurate tracing of suspected shellfish to their source. This change has been previously discussed with the States, and we are not aware of substantial objections at this time.

Recommendation: That the Workshop endorse the above proposed change in the Satisfactory Compliance portion of Item 27.

SECTION C

Packing and Shipping Shell Stock

12. Suggested Change, Page 23, Section C: That a new Item Number 3 be added after item 2 on page 23 which would delineate requirements for shellstock sorting or culling benches and of floor construction if used for sorting or culling shell stock. This would require a revision in the Shellstock Shipper Inspection Form, a copy of which is attached. The proposed wording for this item appears below:

 3. Construction of Sorting Benches, Tables, and Floors.--The tops of sorting benches and tables and contiguous walls to a height of at least two feet above the bench top, shall be of smooth, concrete, corrosion-resistant metal, or other durable, non-absorbent material, free from cracks, and so constructed that drainage is complete and rapid and is directed away from the stored shellfish. Floors, if used for sorting shell stock in shore establishments shall be constructed of concrete or other material impervious to water, and shall be graded to drain quickly, shall be free from cracks and uneven surfaces that interfere with proper cleaning or drainage, and shall be maintained in good condition.

 Satisfactory compliance.--This item will be satisfied when:

 a. Sorting benches and tables to a height of at least two feet above the bench tops or table tops are of smooth, concrete, corrosion-resistant metal, or other durable, non-absorbent material, free from cracks.

 b. Benches drain completely and rapidly, and drainage is directed away from any shellfish on the benches.

 c. Sorters' stools have no attached padding, and are so constructed as to be easily cleaned.

 d. Floors in shore establishments used for sorting shell stock are of smooth, concrete, or of equally impervious tile laid closely with impervious joint material, or of metal surfacing with impervious joints, or of any other material which is equivalent to good quality concrete; and when such floors are maintained in good repair.

 Discussion: This is a new item for shellstock shore establishments and is thought to need a considerable sorting or culling of shell stock which is carried out by the industry. The majority of this culling takes place on the floor of the establishment or on a boat deck.

 Recommendation: That the Workshop endorse the above inclusion.

13. Suggested Change, Page 22, Section C: That Item 25, "Refrigeration of Shucked Shell Stock" be added to the requirement columns under the words "Item No. in Section B" in Table II.

 Discussion: This item is recommended for inclusion in Table II as it is the practice in some areas for shell-stock shippers to distribute shucked shellfish as received from certified shucker-packers. It would require that if shell-stock shippers buy and sell shucked shellfish, they must provide refrigeration equal to that required of shucker-packers.

 Recommendation: That the Workshop endorse the above for inclusion in Table II.

14. Suggested Change, PHS Shell-Stock Shipper Inspection Form 769-3: That the Shell-Stock Shipper Inspection Form be revised to include an Item 3 entitled "Construction of Sorting Benches" which has been previously discussed in change Number 18, to include the refrigeration requirement for shucked shellfish if handled by shell-stock shippers; and to include provision for use of the form to inspect reshipper operations. A copy of the revised form is attached.

Discussion: This revised inspection form now includes an item on construction of sorting benches, an item for refrigeration of shucked shellfish, and provision is made to use a portion of the form for inspection of reshipper operations.

Recommendation: That the Workshop endorse this revised inspection form for shell-stock shippers and reshippers.

SECTION E

15. Suggested Change, Page 25, Section E: That Section E be reworded to emphasize the desirability of more States using the reshipper classification. It is proposed that Section E be reworded as follows:

SECTION E

RESHIPPERS

Persons who reship shellfish from certified shell-stock shippers, shucker-packers, or repackers to other certified shippers or to final consumers should be licensed and certified as reshippers. Use of this shipper classification is left to the option of the State.

(A reshipper is not permitted to shuck shellfish, nor to repack shucked shellfish.) Requirements for a reshipper depend upon the type of product handled and the methods of operation. If shell stock are handled, the applicable requirements outlined for a shell-stock dealer must be met (Section C).

If only shucked shellfish are handled, the required items are:

1. Section B, Item 19 - SOURCE
2. Section B, Item 25 - REFRIGERATION
3. Section B, Item 27 - RECORDS

PHS-769-3
2/29/63

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

FORM APPROVED
BUDGET BUREAU NO.
68-R633

SHELL-STOCK SHIPPER OR RESHIPPER INSPECTION REPORT

Plant Name and Location

Certificate

Product

Number of Employees

Items not applicable to shipper being inspected should be indicated in appropriate block as "NA"

SECTION C.

1. WET STORAGE:

Protected; State Approved 20

2. SHELL-STOCK STORAGE:

Floors, impervious, graded to drain . . . 1
Walls, smooth, well-constructed 1
Conveyances easily-cleanable; clean . . . 1
Not used as a passageway 1
Floor drain protected against backflow. . 1

3. CONSTRUCTION OF SORTING BENCHES:

Smooth; impervious; self-draining 2
Sorter stools cleanable; painted, no padding 1
Floors used for sorting satisfactory. . . 1

4. SHELL-STOCK COOLING

Refrigerated or protected as necessary. . 2

5. GENERAL CLEANLINESS:

No miscellaneous equipment or material. . 2
No animals, fowls, unauthorized persons . 2
Premises clean; no rubbish, or contaminating substances 1

6. RODENT CONTROL:

Rodent free; proper construction. 2
Safe use and storage of rodenticides. . . 2

7. PERSONNEL HEALTH:

Infected persons and carriers excluded . 2

8. SEWAGE DISPOSAL:

Satisfactory 2

9. PLUMBING AND RELATED FACILITIES:

Approved; no cross-connections . 2
Handwashing facilities; soap; single-service towels 2
Handwashing signs posted 1
Toilet rooms clean; good repair; ventilated; lighted; supply of toilet tissue 2
Toilet room doors self-closing tight. 1
No overhead drains 1

10. WATER SUPPLY:

Safe; adequate quantity. 20

11. WASHING SHELL STOCK:

Shell stock clean at time of shipment 1
Washwater from approved sources (see item 10)

12. PACKING AND SHIPPING SHELL STOCK:

Shipping containers clean . . . 1
Shipments properly identified . 1

13. RECORDS:

MS

Purchases and sales 2 25

14. SOURCE OF SHELLFISH:

Approved. 20 25

15. REFRIGERATION OF SHUCKED SHELLFISH:

Internal temperature of stored shellfish 50° F. or less. . . 1 25
Frozen shellfish storage 0° F. or less 1 25

Remarks:

Date

Sanitarian

(Sections and item numbers refer to PHS Publication 33, Part II: Sections C & E, Rev. 1964.)

APPENDIX B (In Shellfish Sanitation Manual)

Recommended Code-dating System for Shucker-Packers and Repackers

The following code-dating system is recommended to the States in establishing their State-wide uniform code-dating system for shucker-packers and repackers as required by item 24:

> A five-digit number and letter system should be established which will reflect the year, the month, the day of the month, and the morning or afternoon in which the shellfish were packed or repacked. Larger packers may wish to indicate morning or afternoon packing by using the letter "A" or "P" in their code system.

Example: 31012

3 - 1963

10 - 10th month, October

12 - day of month

Example: 40510

4 - 1964

5 - 5th month, May

10 - day of month

It is further recommended that repackers be required to precede their code-dating digits with the letter "R" to indicate the product is repacked.

Appendix B (In Shellfish Manual)

NAME OF FIRM John Doe
ADDRESS 12 Spring Road, Benton, Florida
STATE CERTIFICATION NO. 10

SHUCKER-PACKER LEDGER REPORT

QUANTITY PURCHASED OR HARVESTED (INDICATE OYSTERS, CLAMS, OR MUSSELS)	DATE OF HARVEST	DATE OF PURCHASE	STATE AREA DESIGNATION FROM WHICH HARVESTED	NAME AND ADDRESS, OR STATE PERMIT OR LICENSE NUMBER OF HARVESTER	QUANTITY SOLD (INDICATE OYSTERS, CLAMS, OR MUSSELS)	DATE SOLD	STATE PERMIT OR LICENSE NO., OR NAME AND ADDRESS OF PURCHASER
(EXAMPLE OF USE OF FORM BY SHUCKER-PACKERS)							
40 Bushels Oysters	1/12/66	______*	WL - WASH.	WASH. - 28	40 Gallons Oysters	1/12/66	Redwood Foods Inc., Tacoma, Wash.
20 Bushels Oysters	1/14/66	1/15/66	GH - WASH.	WASH. - 7	30 Gallons Oysters	1/15/66	Sea Food Corp., Olympia, Wash.
10 Bushels Oysters	1/14/66	1/15/66	N - ORE.	John Jones 12 Shady Lane Portland, Ore. OREG. - 12	31 Pints Oysters	1/15/66	Cash Sales to Individual Buyers Through Sales Room
					12 Gallons	1/16/66	Toms Grocery 120 Sentinel Highway Aberdeen, Wash.

* Date of Purchase Not applicable since shucker-packer dredged these oysters from his own leased ground.

Appendix B (In Shellfish Manual)

NAME OF FIRM John Doe
ADDRESS 12 Spring Road, Benton Florida
STATE CERTIFICATION NO. FLA. - 12
STATE PERMIT OR LICENSE NO. 1267

SHELL-STOCK SHIPPER LEDGER REPORT

QUANTITY PURCHASED OR HARVESTED (INDICATE OYSTERS, CLAMS, OR MUSSELS)	DATE OF HARVEST	DATE OF PURCHASE	STATE AREA DESIGNATION FROM WHICH HARVESTED	NAME AND ADDRESS, OR STATE PERMIT OR LICENSE NUMBER OF HARVESTER	QUANTITY SOLD (INDICATE OYSTERS, CLAMS, OR MUSSELS)	DATE SOLD	STATE PERMIT OR LICENSE NO., OR NAME AND ADDRESS OF PURCHASER
(EXAMPLE OF USE OF FORM BY SHELL STOCK SHIPPERS (INCLUDES "BUY" BOATS AND "BUY" TRUCKS)							
20 Bushels Clams	1/2/66	1/3/66	NA - FLA.	FLA. -162	5 Bushels Clams	1/4/66	FLA. - 34
10 Bushels Oysters	1/3/66	____*	AB - FLA.	FLA. - 12	5 Bushels Clams	1/5/66	Shipped to Wholesale Inc. 40 Maine Ave., Washington,D.C.
5 Bushels Clams	1/4/66	1/5/66	DF - FLA.	John Jones 24 Reo Place Benton, Florida	1/2 Bushels Clams	1/5/66	Jane Doe, 7 Maryland Road Benton, Florida
					10 Bushels Clams	1/6/66	Delmar Restaurant, 101 Riverside Drive, Miami, Florida
					4 Bushels Clams	1/6/66	Shipped to Krafton Foods, Inc. 106 Trane Ave., Atlanta, Georgia
					8 Bushels Oysters	1/6/66	Shipped to Groceries Inc. 124 Bourbon Street, New Orleans, La.
					4 1/2 Bushels Clams	1/9/66	Destroyed
					2 Bushels Oysters	1/10/66	Destroyed

* Date of purchase not applicable since oysters were tonged by shellstock dealer FLA. - 12 himself from leased ground.

APPENDIX Y

TIME-TEMPERATURE EFFECT ON BACTERIOLOGICAL QUALITY OF STORED OYSTERS

By

C. B. Kelly
Shellfish Sanitation Branch
Public Health Service

INTRODUCTION

One of the major problems in the sanitary control of shellfish is the frequency of exceedingly high coliform densities and plate counts in shucked oysters on arrival at marketing and distribution points. This matter has been of concern to shellfish control authorities for a great many years. Occasionally the plate count and coliform densities and often the fecal coliform densities are of such order of magnitude that the product is obviously unacceptable for consumption. In view of the confirmed observations that commercial shucking houses and repacking establishments generally show good sanitation practices and bacteriological examinations of the product demonstrate relatively low bacterial counts, the problem in maintaining bacteriological quality at the market level would seem to be involved in the time-temperature conditions of storage and transportation from processing area to point of distribution. Cooperative field studies between producing and receiving States have demonstrated these vast differences in bacterial densities, but because traced lot type studies of commercially handled products are difficult to conduct and even more difficult to control, firm knowledge has not been gathered on the actual increases in specific lots of shucked oysters.

The more fundamental approach therefore has been attempted. Commercial packs of shucked oysters processed by industry and stored under carefully controlled conditions of storage should reveal more definitive information concerning the time-temperature effect on the bacterial quality of shucked oysters. This approach has been followed by a number of workers, but in most instances the temperature of storage has not been adequately bracketed to show the relative effect of various temperature situations. In this report temperatures ranging from that produced by packing in ice to the Shellfish Sanitation Manual requirement of 50°F. has been encompassed. Further the studies have been conducted on the two most commonly used species in this country, the Eastern oyster, *Crassostrea virginica* and the Pacific oyster, *Crassostrea gigas*.

The studies on the Eastern oysters were conducted by the Gulf Coast Shellfish Sanitation Research Center, Dauphin Island, Alabama. The Pacific oyster studies were conducted by the Northwest Shellfish Sanitation Research Laboratory, Gig Harbor, Washington. Except for the difference in species procedures followed in the two studies were identical; thus a direct comparison can be made to reveal any species differences.

MATERIALS AND METHODS

Since the procedures followed were identical, description of materials and methods will apply to both studies. Shucked oysters were purchased from commercial shucking establishments and the test portions were prepared as follows:

A large lot of shucked oysters, sufficient for one experiment was taken directly from the regular production of the shucking plant. This lot was washed or blown in the normal fashion and transferred to a skimmer. The lot was again thoroughly mixed on the skimmer and packed by plant personnel in 12 ounce or 16 ounce containers. The cans were then packed in ice and transported to the laboratory where, after withdrawing two cans of oysters for the initial sample, the remaining were subdivided for storage at the three selected temperatures.

Storage at 3°C. and 10°C. (38°F. and 50°F.) was conducted in dry refrigerators equipped with thermoregulators which controlled the temperature to ± 1°C. and small electric fans to provide circulation of air. The third lot was kept packed in ice in an insulated container. Drainage was provided to prevent accumulation of water. Temperature was monitored by recording thermometers and temperature of oysters was taken at each sampling.

Sampling scheduled for the three storage temperatures were as follows:

Iced samples - 0 hour; 1, 2, 4, 7, 10, 15, 20, and 25 days

3° storage - Same as for iced samples

10° storage - 0 hour; 1, 2, 3, 4, 5, 6, and 7 days

On many occasions the Gulf Coast oysters were spoiled before the end of the seven day, 10°C. storage period and therefore were unsuitable for examination. A sufficient number of samples survived storage for five days to provide definitive results.

Bacteriological methods were in accordance with the APHA Recommended Procedures for the Examination of Sea Water and Shellfish(1). A one to one dilution in phosphate buffered distilled water of the shellfish was homogenized and inoculated into decimal dilutions of lauyrl sulphate broth. At least four dilutions, five tubes per dilution were inoculated.

Confirmation for coliform organisms was conducted by transfer to brilliant green lactose bile broth incubated at 35°C. Confirmation for fecal coliforms was conducted by transfer to E.C. broth. The E.C. broth tubes were incubated in a water bath at 44.5°C. ± 0.1°C. Plate counts were conducted using Standard Methods Plate Count Agar. Incubation of the prepared plates was conducted for 48 hours at 35°C. ± 0.5°C. Temperature and pH of the sample was taken immediately after removal from the storage box. Determination of pH was by electrometric method, using a glass electrode pH meter.

RESULTS

In the Pacific Coast studies on the Pacific oyster fifteen lots were tested. The oysters were obtained from several commercial establishments in the States of Washington and Oregon and were quite representative of the quality and source of shucked oysters in that area. The possibility of seasonal variation was considered in the Pacific Coast studies. Oysters were obtained during November, March, April, and June. The number of lots taken during these seasons was quite similarly dispersed. The Gulf Coast studies were conducted during February and March of 1964. The oysters were obtained from shucking plants located in two shellfish growing areas in Alabama.

Review of the Pacific Coast data revealed that the pattern of behavior at the three seasons tested was identical, therefore, the results obtained on all lots were grouped for statistical summarization. Geometric mean values were determined for each storage time and temperature and the results are presented in Tables 1 and 2. The changes in bacterial content and pH are shown graphically in figures 1, 2, 3, and 4. Results obtained in both studies are shown in these figures.

Changes in coliform density are shown in figure 1. Multiplication of coliform organisms occurred even in oysters packed in ice and the rate of multiplication was similar to that observed during dry storage at 3°C. Multiplication at 10°C. was much more rapid. The increase during five days storage at 10°C. was in order of magnitude 3.5 to 4 log cycles (4,000 to 10,000 fold), at least ten times the increase found during storage at 3°C. or packed in ice during the entire 25 day storage. Figure 2 shows the behavior of the fecal coliform organisms. With one exception the pattern is one of slight reduction at a fairly steady rate throughout the storage period. As with the coliform organisms the general behavior at ice storage and 3°C. is almost identical in both studies. At 10°C. the changes in fecal coliform showed different patterns in the two studies. The Pacific oysters showed an overall increase of approximately two-thirds of a log cycle during a five day period of storage. The Gulf Coast oysters showed an overall decline in the same order of magnitude. It is of interest to note that the IMViC pattern of the E.C. gas positive tubes involved in the 10° stored samples did not show significant change during the storage period.

The changes in plate count (figure 3) are quite similar to those observed of the coliform organisms. As one might expect the plate count results show the greatest difference in the two studies, but the rates still are quite similar. In all cases the logistic curve is suggested with an initial decline or at least a lag phase followed by a more rapid increase during the middle stages of the storage period and finally a reduction in the rate of increase during the final stages of storage. The overall increases at 10° storage were, as with the coliform organisms, the same during the five days storage at that temperature as was observed in twenty to twenty-five days of storage at 3°C.

Changes in pH are shown in figure 4. Here one can see a study decline, the rate being a function of storage temperature. As with the bacterial parameters, the overall decline at 10°C. was approximately the same during five days of storage as was observed during twenty-five days of storage packed in ice or in the dry refrigerator at 3°C.

DISCUSSION

The data presented confirm and extend observations previously made in a number of reports. Presnell and Kelly(2) show rapid rises in coliform MPN and plate count in shucked Eastern oysters stored under commercial conditions at a temperature from 2 to 12°C.(36 to 54°F.). Simultaneous testing of fecal coliform organisms revealed no change during the same period of storage. Wilson and McCleskey(3), in experiments on Gulf Coast oysters recorded similar results.

The results on Pacific Coast oysters also are similar to those reported previously by Kelly, et. al.(4) and Presnell(5), and by Liebman, et. al.(6). In all reports coliform increases were observed at storage temperatures of 3°C.(38°F.). Liebman reports attainment of a putrid condition in Pacific oysters stored approximately four days at 53°F. and approximately eight days at 46°F.

It is evident from the current work and that of others that storage at 50°F. results in exceptionally rapid increases in microorganisms. It is also evident that as one approaches 33°F. the rate of multiplication of microorganisms becomes much lower. In fact, the results with fecal coliform organisms suggest a practically static condition with certain bacterial forms at this temperature range.

The data on the fecal coliform group confirmed Presnell's(5) observation that this group "showed the most consistent patterns of change and was least influenced by duration or condition of storage or by season". In one series of experiments fecal coliform densities did increase somewhat during storage at 10°C.(50°F.). However, the rapid increases in coliform and 35°C. plate count densities at this temperature and the rapid deterioration of the oysters indicated that 50°C. is not an effective storage temperature for shucked oysters. Fecal coliform densities decreased slightly during storage at 3°C. and in ice, but in view of the enormous increases in coliform and 35°C. plate count densities the stability of the fecal coliform group at these temperatures was remarkable.

Since fecal coliform densities increased at 10°C. it would be reasonable to suspect that enteric pathogens might also multiply during storage at this temperature. Similarly one might postulate that the numbers of enteric pathogens might be reduced during storage at 3°C. and in ice, though there is not direct evidence from the current studies to support these conjectures. However, Presnell and Kelly(2) in studies on shucked oysters stored at 4 to 7°C.(39 to 45°F.) and at 20°C. demonstrated a parallelism in the behavior of E. coli and a mixture of three Salmonella types. At the lower storage temperature, E. coli and Salmonella densities remained practically unchanged. At 20°C. (68°F.) rapid multiplication of both groups of organisms occurred.

CONCLUSIONS AND RECOMMENDATIONS

1. It is evident from the results presented in this report and those of other investigators that 50°F. is not a satisfactory temperature for prolonged holding shucked oysters because of the rapid increase in microorganisms

observed at that temperature. The frequent multiplication of fecal coliforms at 50°F. is of particular concern in view of the demonstration of parallel behavior of Salmonella organisms.

2. The rates of enzymatic action causing autolysis are also temperature dependent, as confirmed by the fact that spoilage occurred in five days storage at 50°F., but not until twenty to twenty-five days at 38°F.

3. The results, therefore, indicate the need for lower refrigeration temperatures in the commercial handling of shucked oysters. Although the ideal and sometimes the more convenient and practical method would be packing the containers in ice, improved refrigerated transportation equipment using dry storage should be recognized.

4. In view of the observations that dry storage at temperatures 40°F. or less produced almost equal preservation, this method of refrigeration should produce acceptable results.

5. It is quite obvious that the current Manual requirement of 50°F. may be adverse from the public health viewpoint and certainly is not satisfactory to prevent spoilage over the period of time that shucked oysters normally are in transit from the shucking house to distribution points.

6. To protect the public health quality of shucked oysters and to provide adequate preservation temperatures the commercial refrigeration practices for shucked oysters should be revised. Dry storage at 40°F. or storage in ice would produce acceptable preservation of the product both from the public health viewpoint and for the prevention of spoilage during normal commercial handling.

REFERENCES

1. Recommended Procedures for the Bacteriological Examination of Sea Water and Shellfish, 3rd Edition, 1962, American Public Health Association.

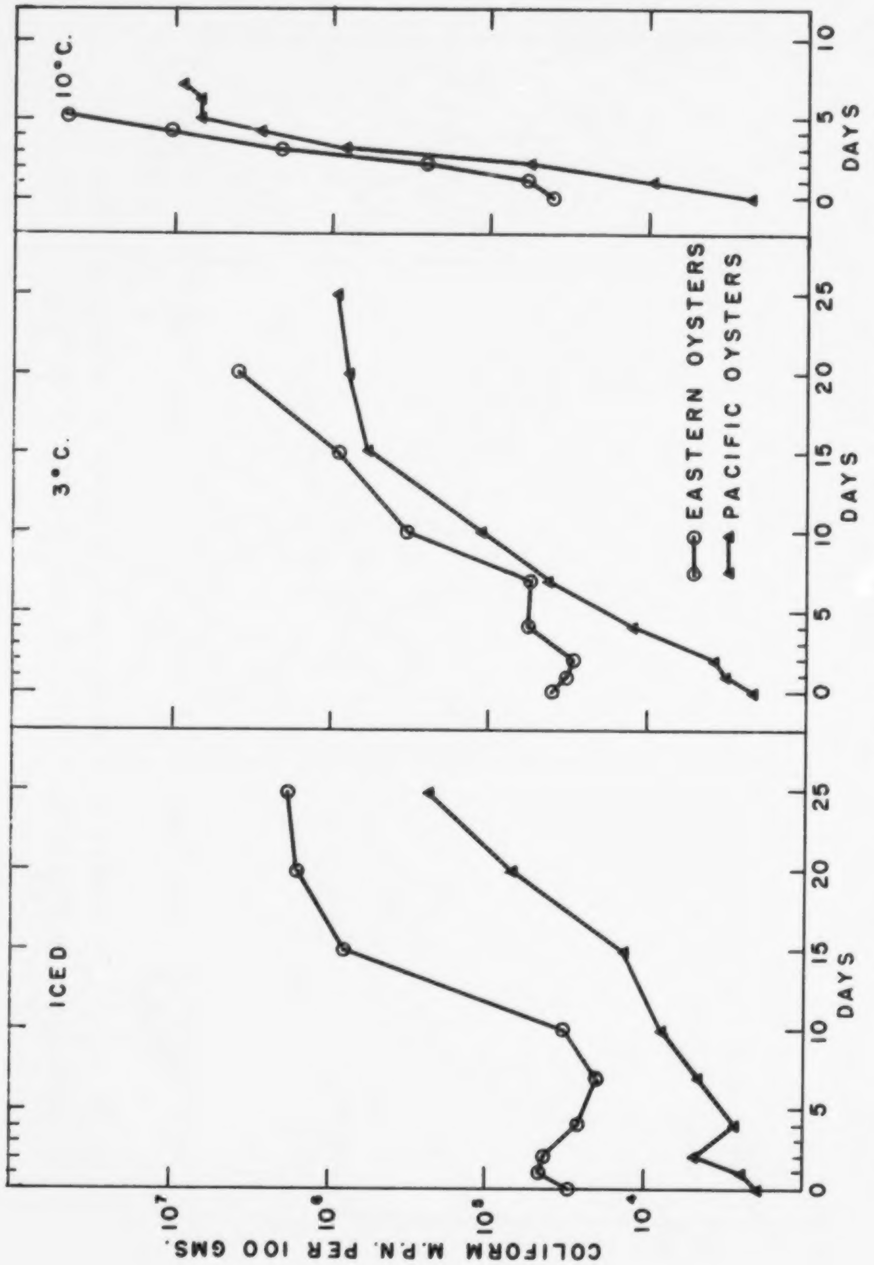
2. Presnell, M. W. and Kelly, C. B., Bacteriological Studies of Commercial Shellfish Operations on the Gulf Coast.

3. Wilson, Thomas E. and McCleskey, C. S., Indices of Pollution in Louisiana Oysters, Food Research 16, 313, (1951).

4. Kelly, C. B., Presnell, M. W., and Zobel, K. J., The Effect of Commercial Handling and Storage on the Bacteriological Quality of Pacific Oysters, Proceedings Shellfish Sanitation Workshop, November 28-30, 1961, U. S. Department of Health, Education, and Welfare.

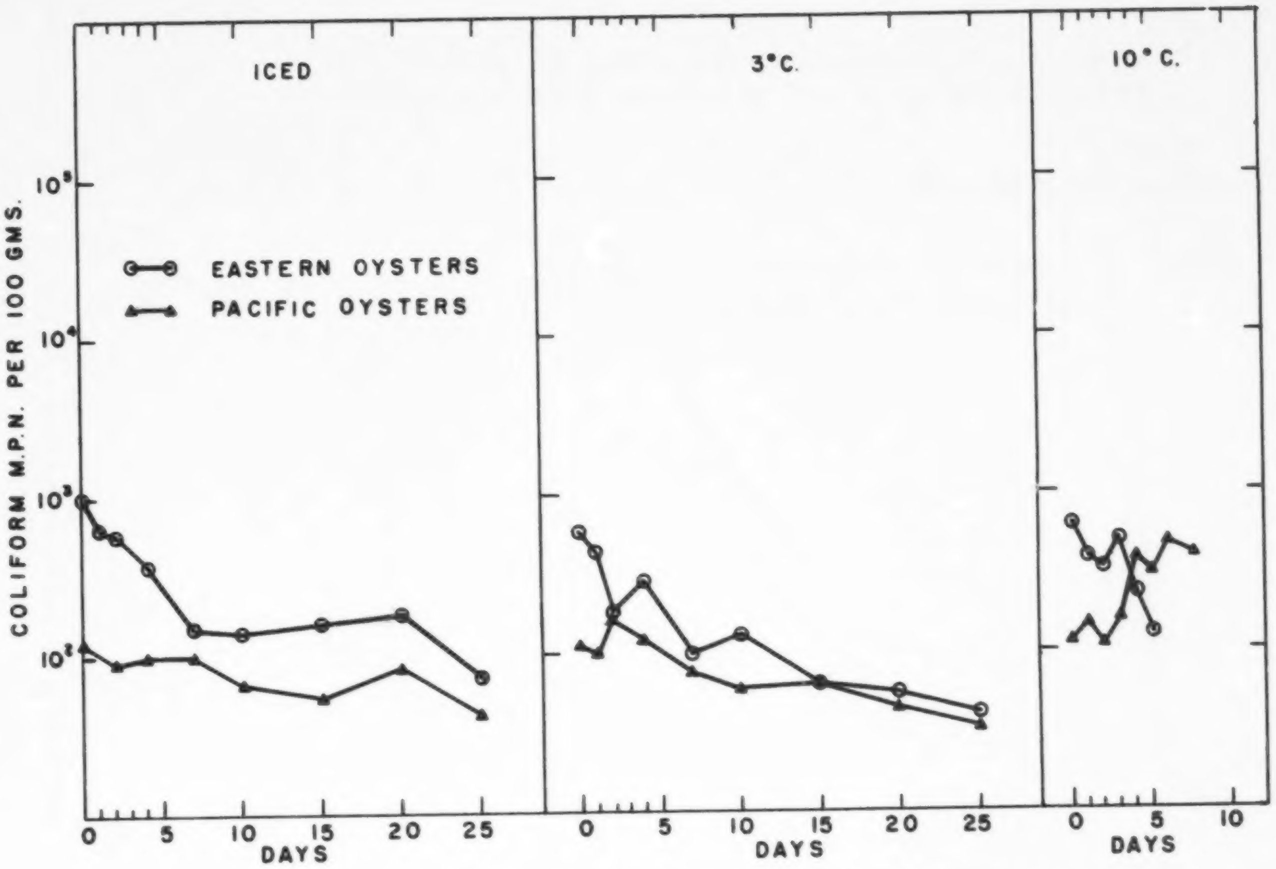
5. Presnell, M. W., Studies on Stored Pacific Oysters, 1962 Shellfish Sanitation Research Conference, Gig Harbor, Washington.

6. Liebman, H. L., Kudo, G., Chapel, J. G., and Stern, J. A., Effects of Temperature on the Storage Life of Fresh Shucked Pacific Oysters, Commercial Fisheries Review 19, No. 12, (1957).



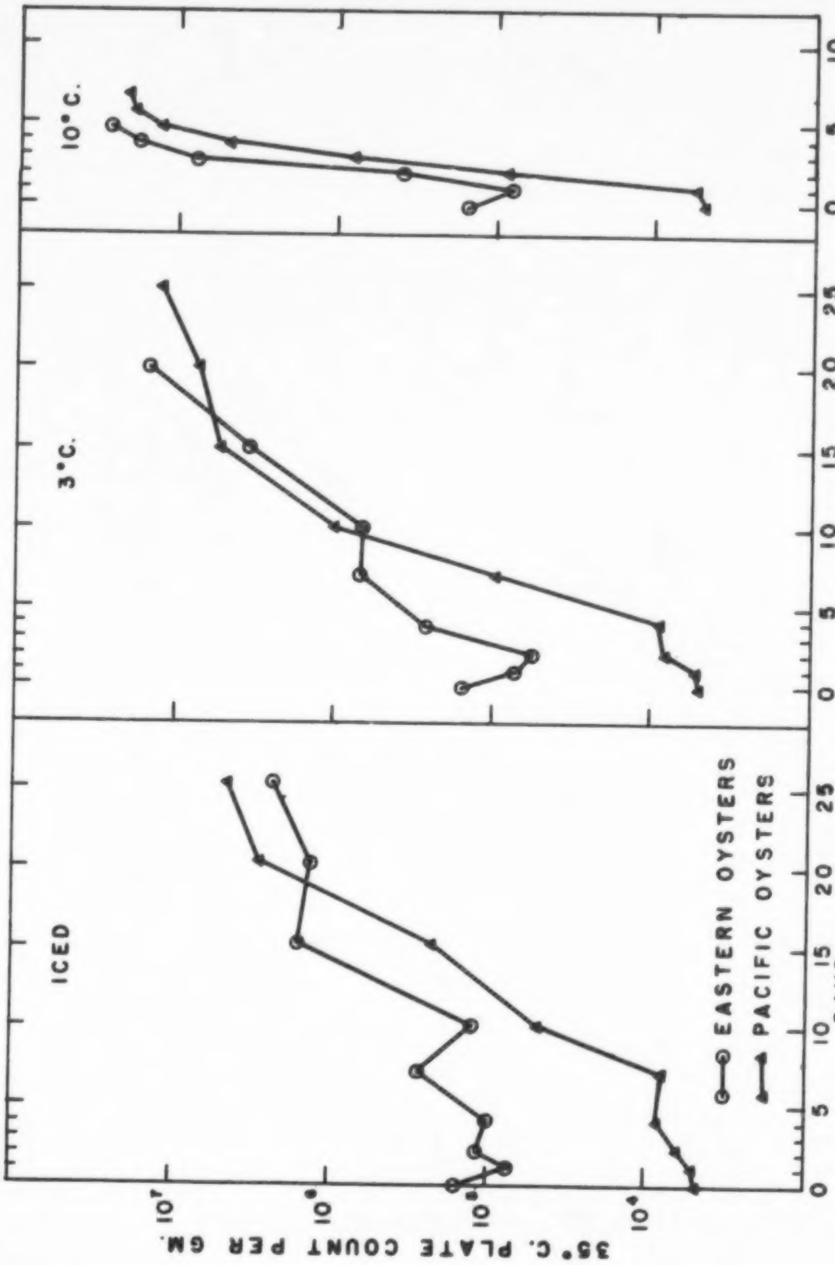
COLIFORM M.P.N. IN PACIFIC AND EASTERN OYSTERS STORED IN ICE AND AT 3°C. (37.5°F.) AND 10°C. (50°F.).

Figure 1.



FECAL COLIFORM M.P.N. IN PACIFIC AND EASTERN OYSTERS STORED IN ICE AND AT 3°C. (37.5°F.) AND 10°C. (50°F.).

Figure 2.



35°C. PLATE COUNTS IN PACIFIC AND EASTERN OYSTERS STORED IN ICE AND AT 3°C. (37.5°F.) AND 10°C. (50°F.)

Figure 3.

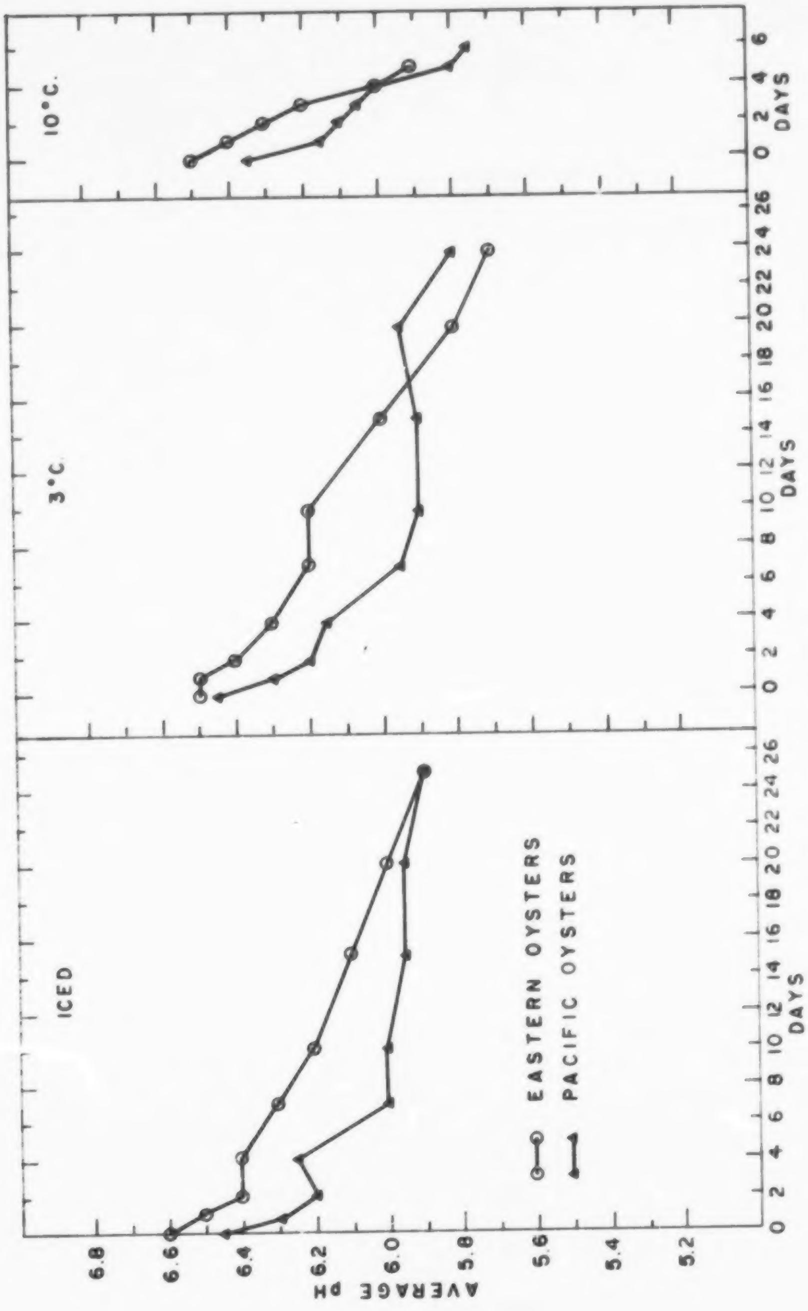


Figure 4.

pH IN PACIFIC AND EASTERN OYSTERS STORED IN ICE AND AT 3°C. (37.5°F.) AND 10°C. (50°F.).

Table I. Bacterial Changes in Stored Pacific Shucked Oysters

Temp.	Days of Storage	Coliform MPN per 100 gm.	Fecal Coliform MPN per 100 gm.	Standard Plate Count per gm.	pH
ICED	0	2,000	120	5,200	6.45
	1	2,600	120	5,600	6.30
	2	5,100	100	6,400	6.20
	4	2,900	110	8,600	6.25
	7	4,600	110	7,900	6.00
	10	8,400	69	47,000	6.00
	15	15,000	62	230,000	5.95
	20	68,000	84	3.1×10^6	5.95
	25	220,000	43	4.7×10^6	5.90
3°C. (37.5°F.)	0	2,000	120	5,200	6.45
	1	3,100	110	5,400	6.30
	2	3,800	120	8,500	6.20
	4	12,000	120	8,900	6.15
	7	42,000	78	100,000	5.95
	10	110,000	65	1.0×10^6	5.90
	15	590,000	69	5.7×10^6	5.90
	20	760,000	46	7.6×10^6	5.95
	25	850,000	33	1.3×10^7	5.80
10°C. (50°F.)	0	2,000	120	5,200	6.45
	1	8,700	150	5,900	6.15
	2	55,000	110	87,000	6.10
	3	800,000	160	810,000	6.05
	4	3.0×10^6	390	5.3×10^6	6.00
	5	6.4×10^6	290	1.3×10^7	5.80
	6	6.1×10^6	480	1.9×10^7	5.75
	7	8.2×10^6	430	2.1×10^7	----

Table 2. Bacterial Changes in Stored Eastern Shucked Oysters

Temp.	Days of Storage	Coliform MPN per 100 gm.	Fecal Coliform MPN per 100 gm.	Standard Plate Count per gm.	pH
ICED	0	33,000	990	150,000	6.60
	1	47,000	660	74,000	6.50
	2	43,000	610	120,000	6.40
	4	26,000	390	100,000	6.40
	7	22,000	150	270,000	6.30
	10	36,000	140	130,000	6.20
	15	780,000	160	$1.6\text{x}10^{6}$	6.10
	20	$1.5\text{x}10^{6}$	190	$1.3\text{x}10^{6}$	6.00
	25	$1.8\text{x}10^{6}$	74	$2.3\text{x}10^{6}$	5.90
3°C. (37.5°F.)	0	40,000	630	150,000	6.50
	1	30,000	490	72,000	6.50
	2	29,000	190	58,000	6.40
	4	60,000	290	270,000	6.30
	7	56,000	100	730,000	6.20
	10	310,000	130	680,000	6.20
	15	860,000	67	$3.4\text{x}10^{6}$	6.00
	20	$3.6\text{x}10^{6}$	58	$1.5\text{x}10^{7}$	5.80
10°C. (50°F.)	0	40,000	630	150,000	6.50
	1	58,000	410	85,000	6.40
	2	240,000	320	380,000	6.30
	3	$2.0\text{x}10^{6}$	510	$7.9\text{x}10^{6}$	6.20
	4	$1.0\text{x}10^{7}$	250	$1.8\text{x}10^{7}$	6.00
	5	$4.4\text{x}10^{7}$	130	$2.7\text{x}10^{7}$	5.80

APPENDIX Z

SUGGESTED CHANGES FOR PART III - PUBLIC HEALTH SERVICE APPRAISAL OF STATE SHELLFISH SANITATION PROGRAMS

By

William A. Felsing, Jr.
Shellfish Sanitation Branch
Public Health Service
San Francisco, California

The Public Health Service has accepted a number of responsibilities in the conduct of the Cooperative State-PHS-Industry Program for the Certification of Interstate Shellfish Shippers, one of the most important being the annual review and evaluation of State control programs to determine their compliance with the agreed-upon standards. The Public Health Service either endorses or withdraws endorsement of the State programs on the basis of the information thus obtained. To facilitate the review of the State programs, a numerical appraisal procedure was developed in 1945. Unfortunately this procedure proved unsatisfactory as it lacked specific instructions for the review officer. In 1958, the Public Health Service, guided by previous Workshop discussions and recommendations, initiated the development of a more objective appraisal procedure for evaluation of the degree of compliance with the agreed-upon practices of the Cooperative Program. The initial draft of the appraisal procedures was developed in 1960 and distributed to the PHS Regional Offices for their critical review and comments. A second revised draft was then prepared and submitted to the Regions, States, and industry for their review. The resulting comments and suggestions resulted in a third draft which was tentatively adopted by the 1961 National Shellfish Sanitation Workshop.

The interim appraisal system has now been successfully used by the Service for the past three years. The Regional Consultants have found the appraisal manual to be extremely valuable in guiding and assisting them in the conduct of the evaluation of the State shellfish sanitation control programs. However, one of the most significant benefits of the appraisal system has been the achievement of much greater uniformity among the State program appraisals. Although Part III of the Manual was considered still in the development stage in 1961, its field usage for the past three years has disclosed relatively few areas of weakness or inadequacies. Numerous discussions with the State shellfish control agencies have revealed that they are also generally satisfied with the tentative appraisal procedure. A few of the States have, however, expressed concern over low ratings obtained in several of their program elements although they have concurred with the PHS that these program elements were weak and needed strengthening. In several instances, the low ratings tended to be a reflection of the transitional phase of "adapting" the State program files to the provisions of the new appraisal system and were not necessarily a reflection of serious program deficiencies.

The following proposed changes to Part III reflect the suggestions and recommendations resulting from PHS Regional shellfish sanitation conferences and from discussions with individual State shellfish control agencies. The recommended changes are, for the most part, relatively minor in nature and are required principally for maintenance of Manual uniformity or compatibility with the proposed or suggested changes to Part I of the Manual:

1. Suggested Change, Page 3, Definitions: It has been recommended to expand the Table of Representative Numbers in order to facilitate determination of the minimum number of units to be inspected where there are greater than 105 units.

   Discussion: None

Recommendation: It is recommended that Table of Representative Numbers be expanded to include the following:

Number of Units	Minimum Number to be Inspected
106-116	33
117-130	34
131-147	35
148-167	36
168-191	37
192-222	38
223-262	39
263-316	40

2. Suggested Change, Page 3, Definitions, Representative Numbers, Number of Units: It has been questioned whether the Table of Representative Number of Units was to be used relative to the PHS inspection of approved growing areas as indicated by the footnote, page 3. If so, this is in conflict with the last sentence of the fourth paragraph of page 16 which states: "Where possible, program appraisals should be so scheduled that all 'approved' areas will be reviewed at least once during each four-year period."

   Discussion: The Table of Representative Numbers was not originally intended to apply to growing areas, but was to be used as a guide for inspection of interstate shellfish shippers, harvesting boats, trucks, etc.

   Recommendation: It is recommended that the footnote for Number of Units be revised to read as follows:

   * Interstate shippers, boats, trucks, oyster culture rafts, etc.

3. Suggested Change, Page 5, Item 2(a): At the 1961 Shellfish Sanitation Workshop the question was raised as to the legality of State officials requesting official participation in the Cooperative State-PHS-Industry Program for the Certification of Interstate Shellfish Shippers. It has also been suggested that States who have participated in the program without interruption since their original participating action should be excluded from this requirement.

   Discussion: With regard to the first point, discussion with the Services General Counsel's Office indicated it was their view that since the Cooperative Program is a voluntary partnership between the Public Health Service, the States, and the shellfish industry, any item or requirement is legal if all three partners agree to it. In regard to the second point, it has been pointed out by several States that their continued participation in the program since their original participating action is quasi-evidence that they recognize their responsibilities and intend to continue in the program.

   Recommendation: That the first sentence of item 2(a) be changed to read as follows:

   > Each State desiring to participate in the Cooperative Program will submit a formal request to the PHS Regional Health Director: Provided, that this requirement will apply only to States entering the program on an original basis or after a lapse in participation.

4. Suggested Change, Page 5, Section A, Item 2(a): There has been some question in those States where one or more agencies share program responsibilities whether or not both agencies should submit a request to the PHS for participation in the Cooperative Program.

   Discussion: It is not considered necessary for each of the various agencies to submit a request to the PHS, but only that agency having the primary responsibility for carrying out the control program. The request should, however, include a statement that an interagency memoranda of understanding has been developed between the various responsible agencies defining each of their responsibilities in the Cooperative Program in accordance with item 2(i), page 7, Part I of the Manual.

Recommendation: It is recommended to revise the second sentence of paragraph 2(a) to read as follows:

> This request, to be signed by the senior official of the State agency having primary responsibility for shellfish sanitation control, shall include a statement to the effect that an inter-agency agreement exists between the State agencies sharing program responsibilities and that the State recognizes its responsibilities and obligations in the Cooperative Program, and is willing to assist the PHS in making necessary reviews and inspections for State program appraisal.

5. Suggested Change, Page 5, Section A, Item 2(e): Objection has been made to the lack of a provision in item 2(e) to permit the State sufficient time to correct program deficiencies before withdrawal of PHS endorsement in the event that any of the program elements drop below 70 percent.

Discussion: It has been pointed out that the PHS State program appraisal reports are generally not completed and submitted to the State until the latter part of May. It is felt that this would not provide the States sufficient time to initiate corrective action on serious program deficiencies before the end of the fiscal year. Activities as sanitary surveys must necessarily be planned well in advance in order to most effectively utilize available resources as it is not always possible to reschedule these activities on a relatively short notice.

Recommendation: It is recommended that paragraph 2(e), page 5, be revised as follows in order to provide the State sufficient time to initiate corrective action on program deficiencies calling for PHS withdrawal of endorsement:

> A State program with a rating of less than 70 percent in anyone of the eight identified program elements - general administrative procedures, laboratory, sanitary survey, relaying, depuration, patrol, harvesting, and shucking-packing - will not be eligible for endorsement by the Public Health Service 90 days after being formally notified of the rating unless the State demonstrates that suitable corrective action has been taken. Withdrawal of the State program endorsement will be initiated by the PHS Regional Office after discussion with the appropriate State officials. and will be subject to review through established PHS policy channels at Headquarters level. If the State desires participation in the Cooperative Program subsequent to PHS withdrawal of endorsement, the Director of the State agency having primary responsibility for shellfish control must make application to the Regional Health Director for reappraisal of the State's program. In submitting this application, the State shall describe the measures taken to correct the noted deficiencies.

6. Suggested Change, Page 6, Section B, Paragraph F: It has been suggested that this paragraph needs further clarification to indicate that the action described therein will only be taken in the event of a public-health emergency.

Discussion: The PHS concurs with the suggested change as it would temporarily suspend endorsement of a State program only if a public-health emergency existed.

Recommendation: It is recommended that paragraph f, page 6, be restated as follows:

> In an emergency situation, the PHS will take immediate steps to temporarily suspend endorsement of a State program when it is found that a condition exists in which interstate shipment of shellfish therefrom would be likely to cause disease. Such action will be initiated by the Regional Program Director through established communication channels after first advising the State of the proposed action.

7. Suggested Change, Page 7, Section B, Last Paragraph: (Also page 38, Section D, 1st paragraph.) It has been suggested that for administrative purposes it would be more desirable to submit State program appraisals to PHS Headquarters June 30 rather than May 30. It has also been suggested that a State should have the right of appeal in case they disagree with the program appraisal.

Discussion: The later submission date would allow the Regional Office additional time to complete the State program appraisals and would provide sufficient time for joint review with the States prior to submission to Headquarters. We have no objection to insertion of an appeals clause in this paragraph.

Recommendation: It is recommended that the Workshop endorse the following rewording of this paragraph:

> Two copies of the State program appraisal, together with the Regional recommendation for endorsement, will be forwarded to the PHS Headquarters Office by June 30 of each year. The Regional Office will also forward copies of the completed review to the Senior Administrative Officer of each State agency involved in shellfish sanitation activities. Any necessary conferences between the Regional staff and the State staffs shall normally be completed prior to the forwarding of the final appraisal to the Headquarters Office. The format of the report is described in Section C. In the event a State disagrees with their appraisal, it is understood that they have the right of appeal to the PHS Headquarters Office: Provided, such appeals are made within 30 days of their receipt of the appraisal.

8. Suggested Change, Page 9, Section B, Form I: It has been suggested that certain changes in the wording of Form I are necessary for clarification and maintenance of uniform Manual language.

Recommendation: It is recommended that the following items of Form I be rephrased as follows:

Title - Appraisal of General Administrative Procedures
Item 1(a) - Classification of actual or potential growing waters
Item 2 - General administrative practices
Item 2(a) - Requirements applied to all actual or potential growing waters
Item 2(b) - Requirements applied to all commercial harvesters
Item 2(c) - Requirements applied to all persons (excluding harvesters) handling shellfish prior to the certified shipper
Item 2(h) - Plant inspectors have necessary inspection equipment

9. Suggested Change, Page 9, Section B, Form I: It has been suggested that there are several additions and/or changes in items 2 and 3 of Section A, "General Administrative Procedures," Part I of the Manual which should be reflected on Form I. These include:

Item 2(l) - Interdepartmental memorandum of understanding complies with Manual requirement (added at 1961 Workshop).

Recommendation: It is recommended that the following changes in items 2 and 3, Form I, be made:

Item 2(l) - This item to be added: "Interdepartmental memorandum of understanding complies with Manual requirement." (See Part I, page 7, item 2(l) - a weight of 5 points to be given this item.)

Item 3 - "Intrastate Sale of Market Shellfish" - delete this item for deductible items in Form I. Include this item in "remarks" section of Form I, (Part III, page 10) for discussion of significant differences in requirements in interstate and intrastate shippers.

10. Suggested Change, Page 11, Section B, "Instructions for Completion of Form I," Item I: It has been suggested that this paragraph is confusing and needs further clarification.

Discussion: None. Suggested change is editorial in nature.

Recommendation: It is recommended to restate item 1, page 11, as follows:

> The sub-items listed under this item relate only to the legal authority for the State's program. Review of the legal aspects of the State shellfish laws and regulations shall be made with the Regional Attorneys. Full credit is to be given on each sub-item if, in the Regional Attorney's opinion, it is the intent of the law or regulation regardless if the State is actually carrying them out in practice. Deductions should be made in item I only if the State clearly does not have adequate legal authority to carry on a program, or if the laws and regulations are not enforceable because of their nature. Deductions should also be made under this item if the legal authority is lacking even though field studies indicate a satisfactory program. Partial scores may be given for the individual items.
>
> Appropriate deductions should be made in Forms III, IV, VI, or VII if field investigations indicate that the sub-items listed under item I are not being complied with.

11. Suggested Change, Page 11, Section B, "Instructions for Completion of Form I," Item 2(e), Sub-item (3): It has been proposed that a more suitable method of reporting plant inspections be devised as the information submitted on Report Form R.O. 1-1 has been found to be of little value to the Regional Consultant.

Discussion: It is felt that the Report Form R.O. 1-1, which is currently submitted to the Regional Consultant on a monthly basis, is not providing the information desired. The PHS feels that it would be more meaningful if this particular form was discontinued, and the Shellfish Consultant and State shellfish personnel jointly prepared a journal of plant inspections designed to permit a rapid review of plant progress. This journal would be maintained in the State's file and submission to the Regional Office would not be required.

Recommendation: Revise the first sentence, item 2(e) (3), page 11, to read:

> Monthly summaries of plant inspection activities are to be maintained by the State in a central inspection report file.

12. Suggested Change, Page 12, Section B, Item 3: It is suggested that item 3, which relates to intrastate shippers be deleted in accordance with proposed change No. 9, item 3, and that a brief paragraph of instruction be inserted in its place which would be worded as follows:

> "Intrastate Sale of Shellfish" - It is clear from a review of the State regulations or inspection of intrastate shippers that standards for intrastate shippers are lower than those for Cooperative Program shippers. This observance, together with the total number of intrastate shippers, should be noted in "remarks."

Recommendation: It is recommended that item 3, page 12, be deleted, and the above paragraph be substituted therefor.

13. Suggested Change, Page 17, Form III: For clarification and maintenance of uniform Manual language, it has been suggested that certain changes in Form III are required.

Discussion: None. Suggested changes are editorial in nature.

Recommendation: It is recommended that the designated column headings of Form III be rephrased as follows:

Column 2 - State Classification
Column 3 - Date of Last Survey or Resurvey
Column 4 - Date of Last Reappraisal
Column 7 - Deduction for Faulty Toxicity Surveillance

14. Suggested Change, Page 18, Section B, Paragraph 4, "Credit for Effective Date of Sanitary Survey": It has been suggested that the Table of "Credit for Effective Date of Survey" be revised for clarity purposes.

Discussion: The present format of the Table has resulted in considerable confusion and misunderstanding among the States and PHS Consultants. The present Table suggests that a sanitary survey is required every four years to receive any credit, whereas a survey or resurvey for each growing area is required only every ten years unless a reappraisal indicates otherwise. (Part I, Section C, page 9, item b.)

Recommendation: It is recommended that the survey credit schedule in paragraph 4, page 18, be revised to read as follows:

Sanitary survey or resurvey within 10 years and reappraisal as follows:

a. Reappraisal within 2 years - 100% credit
b. Reappraisal within 3 years - 85% "
c. Reappraisal within 4 years - 10% "
d. Reappraisal over 4 years - 0% "

Sanitary survey over 10 years and no resurvey - 0% credit

15. Suggested Change, Page 18, "Quality of Survey": It has been suggested to revise the criteria relating to quality of surveys in order to conform with the recommended changes in Part I of the Manual. (See recommended change No. 8, proposed changes to Part I.)

Recommendation: It is recommended that the term "chemical waste" be changed to "chemical (including pesticides)."

16. Suggested Change, Page 19, Section B, Paragraph 3: It has been suggested that this paragraph should be revised to indicate that a narrative statement should be prepared describing deductions for each growing area.

Discussion: This revision is necessary to more adequately explain to the State the deductions made on Form III and to point out the specific weaknesses in each growing area survey in order that corrective action might be undertaken.

Recommendation: It is recommended that the third paragraph, page 19, be revised to read as follows:

> A brief, narrative statement shall be prepared describing each deduction for each growing area.

17. Suggested Change, Page 19, Section B, Paragraph 4: Revise the paragraph for compatibility with the recommended change in column 7, Form III. (See recommended change No. 13.)

Discussion: This change is needed to include all naturally-occurring marine toxins which might be present in oysters, clams or mussels. As this paragraph now reads it is specific for paralytic shellfish poison, and does not cover the marine toxin found on occasion in shellfish from the waters of the Gulf Coast.

Recommendation: It is recommended that the fourth paragraph, page 19, be revised as follows:

> Deduction for Faulty Shellfish Toxicity Surveillance
>
> The surveillance program, incorporating an assay procedure, will be considered as a component of the sanitary survey in those areas in which shellfish toxicity may reasonably be expected to occur. If the inspection shows that the surveillance program is defective, then the rating officer should apply a 40 percent deduction to the area sanitary survey rating (product of column 5 and column 6).

18. Suggested Change, Page 19, Section B, Paragraph 5, "Score": It is suggested that this paragraph be revised for compatibility with the recommended change in paragraph 4, page 19. (See recommended change No. 17.)

Recommendation: It is recommended that paragraph 5, page 19, be revised as follows:

> Score.--Score is the value which results when the product of column 5 and 6 is divided by 100, minus deduction for faulty area surveillance program for naturally-occurring shellfish toxins.

19. Suggested Change, Page 25, Section B, Paragraph 3, 2nd Sentence: It has been suggested that State administrators are reluctant to sign any agreement which would tend to commit them beyond the limits of their authority.

Discussion: One State shellfish control agency has voiced objection to Part III requiring a formalized agreement between the State and the PHS which would guarantee an ideal level of patrol activity in restricted or prohibited areas. The State has pointed out that such actions by their agency would be illegal as it would bind the Governor and the State legislature to supply personnel and/or equipment not currently authorized or funds not already appropriated.

The PHS considers the development of a patrol policy document as absolutely essential for the proper evaluation of State patrol programs, and urges that this requirement be retained. The Service will, however, accept an informal patrol document in lieu of a formalized agreement.

Recommendation: It is recommended to revise the 3rd paragraph on page 25 as follows, and to make the necessary compensatory changes in the "Area Patrol" paragraph on page 27:

> A necessary step preliminary to the evaluation of a State patrol program is a joint State-PHS evaluation of the patrol problems, and a determination of the type of patrol organization and extent of patrol coverage that is required to achieve the desired results. The results of such conferences between representatives of the State and the PHS Regional staff shall be documented and kept on file in the Regional Office. This patrol document shall review and clarify the following elements: (1) method of identification of closed areas; (2) type of patrol problem; (3) listing of areas to be patrolled; (4) frequency and nature of patrol; (5) type and frequency of reporting; and (6) public-educational measures. The patrol document shall be reviewed annually and be revised when necessary.

20. Suggested Change, Page 29, Section B, "Form VII": It has been suggested that the assigned weighted values for the various sanitation items of Form VII are not commensurate with the relative importance of the items.

Discussion: This particular item was discussed at some length at the 1961 Workshop, at which time the following weighted values were agreed upon:

Construction and cleanliness of boats - 50
Construction and cleanliness of trucks - 25
Washing of shell stock - 5
Waste disposal from boats - 20

There continues, however, to be some dissatisfaction with the above assigned weights and it has been recommended that the assigned values be reconsidered. Mississippi and Georgia have suggested values of 40, 30, 15, and 15. Maryland has suggested values of 45, 30, 5, and 20.

Recommendation: It has been recommended that it would be more realistic if the values were reassigned as follows:

Construction and cleanliness of boats - 40
Construction and cleanliness of trucks - 30
Washing of shell stock - 10
Waste disposal from boats - 20

21. Suggested Change, Page 30, "Summary of Shell-Stock Shipper Inspection Form": It has been suggested that there is need to revise PHS Form SS-3, "Summary of Shell-Stock Shipper Inspections." (See attachment.)

Discussion: It has been pointed out that Form SS-3, as it currently appears is needlessly complicated, and requires duplication of the computations required in rating shell-stock shippers on Inspection Form PHS-769-3.

Recommendation: It is recommended that the Inspection Form PHS-SS-3, page 30, be revised as shown on the following page.

22. Suggested Change, Page 31, "Instruction for SS-3 (Tentative)": It has been suggested to delete instructions for Form SS-3 appearing on page 31 of the Manual, as they have been proposed to be placed on the revised form.

Recommendation: It is recommended that the suggested change be made.

23. Suggested Change, Page 36, Section C, Item B: It has been suggested that for clarity and continuity of Manual language, the following sub-items of Item B, Section C, be changed as follows:

Item B - Summary of State Shellfish Sanitation Programs
Item B(1) - Form IX, Summary of Appraisal
Item B(2) - Delete the word "supplementary"

Recommendation: It is recommended that the proposed suggested changes be accepted.

SS-3 (Tentative)
(Revised 11/18/64)

SHELL-STOCK SHIPPER INSPECTION SUMMARY

INSTRUCTIONS

A. Transfer information to columns 1, 2, and 3 from Inspection Reports (PHS-769-3)

B. Multiply each "Final Plant Score" by adjacent "Number of Employees" to obtain "Weight."

C. Add column 3 and enter "Total" on final sheet of computation.

D. Add column 4 and enter "Total" on final sheet of computation. Divide "Total Weight" by "Total Number of Employees" to obtain "Final Rating."

State	Number of Shell-stock Shippers	Number Inspected	Date

Certificate Number 1.	Final Plant Score 2.	Number of Employees 3.	Weight 4.
Remarks:	Totals		
		Final Rating	

APPENDIX AA

USE OF CHEMICALS ON OR NEAR SHELLFISH GROWING AREAS
AN INDUSTRY VIEWPOINT

By

J. Richards Nelson
The F. Mansfield & Sons Co.
New Haven, Connecticut

Although recorded shellfish farming dates back to 75 B.C. when Sergius Orata grew oysters in Lake Lucrinus to please the Roman palate, it has been practiced in this country for only about a hundred years. Never an exact science, it evolved a general pattern dictated by the nature of the oyster, which is a brackish water form. It spawns, sets and grows in waters of low salinity in which its two main enemies, the prolific starfish and drill, cannot exist. Thus seed was obtained largely in harbors and areas close to shore. The seed was subsequently planted and virtually stored in the north in Long Island Sound, in deeper waters of higher salinity, better protected from storms. There they grew slowly building thicker shells and stronger muscles, making them better able to withstand the ravages of their enemies. After two or three years there they were transplanted to shallower beds suitable for fattening for market. Such areas are always infested with drills. The oyster is so prolific that sufficiently large amounts of seed were obtained to leave, in most years, a considerable harvest, even after the starfish in deeper waters and drills in the shallower areas had done their damage. Control of starfish was largely, and still is, by means of mopping and scattering of lime on the beds. Drill control was never solved. Efforts were largely confined to cleaning the beds with a vacuum-cleaner type of dredge.

The rapid growth of population along our shores with resulting expansion of industry, housing and the use of new chemicals, such as detergents, has drastically altered the environment in the last twenty years. The organic and chemical pollution of rivers and harbors has forced the growers of shellfish farther and farther off shore into areas of higher salinity. Many setting grounds have been ruined. In the United States oyster production has declined from a recorded 152 million pounds in 1908 to 56 million pounds last year. In the north in Long Island Sound, the majority of oyster farmers have given up their holdings, leaving only a handful. In addition, unprecedented hordes of starfish invaded Long Island Sound beginning in 1957, when there were few oystermen left to help protect the remaining oyster beds.

The result is that it is now necessary to plant what set is available immediately in shallower areas, subjecting them not only to storm damage but more important to the drill. The small stock is thin shelled and the attrition from drills seriously weakens the industry. Thus it is obvious that pest control is essential if the shellfish grower is going to do his share in producing the finest kind of protein food for our fast increasing population.

Although pesticides were being used in land farming fifty years ago and have become of basic importance, it is improbable that such uses can ever become as important a factor in marine farming. There are several reasons for this. First, is the rapid and infinite dilution of any chemical soluble in sea water. Second, there is the difficulty of treating a crop out of sight in water. (The brief use of scuba divers has shown some interesting results.) The third, of prime importance, is the danger of using any highly toxic chemical that might be stored by shellfish, making them unfit for consumption. We, in the industry fully realize the necessity of raising oysters and clams, in fact all shellfish, that can be consumed raw or cooked with complete confidence and safety. Unless we do this the shellfish industry cannot exist.

The use of chemicals in shellfish farming is at present only on a limited basis. One example of this is the control of "Shell Disease," a fungus, in Holland by soaking very young oyster seed, during the transplanting operations, in a solution containing an organic salt of mercury. Of this method, devised by Dr. P. Korringa, Dr. C. M. Yonge, in his book "Oysters," says: "This killed the fungus in the shell without affecting the oysters, which closed the valves tightly."

Another use in the control of fungus and pathogenic bacteria in the raising of oyster and clam larvae is shellfish hatcheries. Antibiotics were used for this purpose and gave good results at first, but have been less and less effective as their use continued. Consequently, they have been little used during the past two years. Certain sulfa drugs are giving better results at the present time.

A third example is the control of oyster drills and other predatory snails by the application of polystream bonded on kiln dried washed sand, which is then either used as a barrier around the shellfish bed to control invasion or is used directly on the bed before seed is planted. This method, developed at Milford, Connecticut Laboratory by Dr. V. L. Loosanoff and his associates, shows a great deal of promise. Results to date show good snail control. Continued use will be necessary, however, to assess its ultimate value.

The fact that the chemical is drastically insoluble in sea water makes it long lasting and also minimizes the danger of absorption in shellfish tissue. Its effectiveness comes through contact by the snail when its foot is extended.

It is my understanding that preliminary feeding tests show extremely low toxicity for polystream. Also a considerable number of tests have been carried out on oysters and clams grown on treated beds. These show uniformly negative tests after 21 days from the original application.

These steps toward chemical control are just a beginning. Not only do the starfish and drill need to be controlled, but there are marine weeds, fungi and shellfish diseases to be studied. The whole field of chemicals which break down quickly and become harmless needs to be looked at for possible uses. Marine pesticide control is decades behind agriculture. The development of our knowledge of how to use chemicals in this highly specialized field must be based on fundamental research in marine biology. We in the industry are more than pleased with this viewpoint of the Public Health Service and pledge you our complete cooperation.

C
O
P
Y

THE F. MANSFIELD & SONS CO.

Founded 1846

OYSTER FARMS

610 Quinnipiac Avenue
New Haven, Connecticut

November 21, 1964

Mr. Leroy S. Houser, Chief
Standards Development Section
Shellfish Sanitation Branch
Division of Environmental Engineering
and Food Protection
Department of Health, Education, and Welfare
Washington, D.C. 20201

Dear Mr. Houser:

The enclosed letters and attached information from two West Coast oyster growers regarding the use by them of Sevin for the control of shrimp that destroy their oyster bottoms, are for your records and should be appended to the paper that I prepared for the recent Workshop under the title of "Use of Chemicals on or Near Shellfish Growing Areas -- An Industry Viewpoint."

You will note that the State of Washington has already adopted a system of control which appears to be highly effective. In Connecticut we have a system by which any projected use of chemicals on or near shellfish beds must be approved by the State Department of Health, the Shell Fish Commission, and the United States Fish and Wildlife Service biologist in charge at the Milford, Connecticut laboratory. In addition, no applications are permitted on or near stock that is to be marketed during the same season; and a sample from beds that have been treated with polystream within a year must be tested before a marketing permit is granted.

It is evident that adequate safeguards are being provided for any projected use of chemicals on shellfish beds, and that this matter does not need to become part of the manual at this time.

Very truly yours,

THE F. MANSFIELD & SONS CO.

/s/

J. Richards Nelson, Treasurer

Enclosures

cc:
Messrs. Wiegardt and Edwards

C
O
P
Y

COAST OYSTER COMPANY

SOUTH BEND, WASHINGTON

PRODUCERS & PACKERS

Willapa Harbor
Grays Harbor
Humboldt Bay

November 12, 1964

Mr. J. Richards Nelson
F. Mansfield & Sons Company
New Haven, Connecticut

Dear Dick:

It is good to know that you will be presenting the industry's viewpoint related to the use of chemicals on or near shellfish growing areas at the forthcoming National Shellfish Sanitation Workshop.

Knowing that there is concern on the part of the shellfish industry and the regulatory authorities about the above matter, and that it is the consensus of opinion of many of the shellfish control authorities that a great deal of additional research is needed before a satisfactory approach can be made to the overall pesticide problem. We, therefore, are concerned that the Workshop may take action that will preclude the use of chemicals, such as Sevin, in predator control work until the overall problem has been resolved, even though these have been thoroughly tested and have been found "safe" for controlled use in shellfish growing areas.

We would like to call to your attention the system currently being used by the State of Washington, Department of Fisheries, and endorse it as being a system whereby the industry and the regulatory agency can develop a safe program for the controlled use of chemicals which have been approved for shellfish predator control work.

Am enclosing reference material covering the paper work on one of the projects conducted by our company this year that will allow you to follow a typical pest control project from its inception through to the final conclusions. Hoping they may be of service to you at the Workshop.

With kindest personal regards.

Very truly yours,

COAST OYSTER COMPANY

/s/

Malcolm B. Edwards, Mgr.
Oyster Seed Division

Enclosures

STATE OF WASHINGTON
DEPARTMENT OF FISHERIES

SHELLFISH LABORATORY
BRINNON, WASHINGTON

SHELLFISH PEST CONTROL PERMIT # 6404

1. This permit is issued to Coast Oyster Company
whose address is Star Route, Box 31, Aberdeen, Washington
for treatment of approximately 50 acres of private oyster ground
in Grays Harbor near Ocosta.
Specific location: Beds NCP #4 and #5 (Tax #527 and #528) located east of the Channel to South Bay.

2. The treatment is for the purpose of chemical control of ghost shrimp,
using Sevin (MGS 80 W or equal) at the rate of
10 lb. active Sevin per acre on part of the tract, and
------------- at the rate of
-------- per acre, by helicopter
under the direction of Ralph Johnson.

3. Treatment may be done between 6:30 a.m. and 8:00 a.m. on
June 24, 1964 (or other mutually agreed time and date) in
the presence of Washington Department of Fisheries representative.

4. No Sevin water spray mixture is to be applied before the ground becomes bare on the outgoing tide or after the time of low water.

5. No granular Sevin is to be applied -----------.

Shellfish Pest Control Permit # 6404 (cont'd.)

6. No Sevin water spray is to be applied closer than 200 feet to oysters of marketable size.

7. No granular Sevin is to applied closer than ____________ to oysters of marketable size.

8. No oysters or oyster seed may be planted on the ground until 5 day(s) after the application of Sevin mixtures.

Marshall Thayer
Acting Director

STATE INSPECTORS REPORT FORM

Shellfish Pest Control Permit # ______ Inspection # ______

Date ____________ Time of Day ____________ Tide ______

Interval after treatment: Days ____________ or hours ______

General area: ____________ Sub Area ____________

Size of treated plot: ____________

Type of chemical: ____________ How applied ____________

When applied: Date on permit ____________ Date applied ____________

Time of day: Application started ____________ Completed ____________

Tide ____________

Pounds of chemical applied: ____________ Acres covered ____________

Did application overlap?: Low Tideline? ______ Slough or channel? ______

Oyster plantings? ______. Was there any apparent drift due to wind? ____________ Tide current? ____________

State Inspectors Report Form (Cont'd.)

Inspection Notes:

1. List observed organisms:

Dead ______________________________

Dying ______________________________

Irritated ______________________________

Apparently unaffected ______________________________

Were Dungeness crabs observed? __________ Dead ______________

Cast carapaces? _________ Were dead food fish observed? _______

Species? ______________________________

2. What change in character of ground? ______________________________

____

3. Is there observable residue of chemical? Yes____ No_____

If so, ______________________________

____

4. Remarks and conclusions: ______________________________

____

____

____

____

Inspected by: ________________

WASHINGTON DEPARTMENT OF FISHERIES
Shellfish Laboratory - Brinnon, Washington
796 - 2185

1. Coast Oyster Company — Star Route - Box 31
Applicant's name (please print) — Address

Aberdeen, Washington — Ocosta 2641
City or town — Phone

2. Grays Harbor — NCP #4 & #5 - Tax #527 & #528
Bay, harbor, inlet — Bed number or location

3. I (we) desire to treat 50 acres of tidelands with

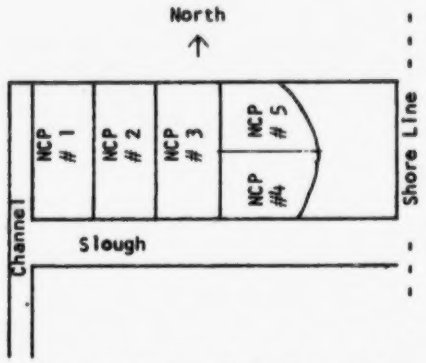
Miller's MGS80W for control of ghost or mud shrimp and wish
Brand name of chemical

to plant this ground with Seed oysters on or about
Seed, transplant, market

April 1965.
Date

4. What is specific location of bed and layout of adjacent plantings? (Make sketch showing approximate distances from other plantings, sloughs, shore, etc. Please indicate North on sketch.)

Nearest plantings of oysters to NCP #4 & #5, area to be treated is on NCP #3 which is separated by a small slough approximately 75 ft. in width. NCP #3 presently has 1963 Japanese seed planting, which will be transplanted during 1964-65 season.



NCP #4 & #5 in Tax #528 of South Bay in Grays Harbor to be treated with Millers MGS80W. 50 acres to be treated.

Washington Dept. of Fisheries (cont'd.)

5. What type of ground? Sand
Sand, mud, eel grass, gravel, etc.

6. Are market sized oysters planted adjacent to ghost shrimp infested tract you wish to treat? No When are they scheduled for harvest? ______

7. What method of application is planned? Helicopter
Helicopter, airplane, hand, or power spray, etc.

8. Who will apply pesticide? Vertex Helicopter Service - Commercial applicator
Commercial applicator, self, employees

9. Describe markers outlining plots to be treated: Will be staked out with double stakes on four corners of each tract.

10. Upon what dates would you propose to make the treatment? June 24, 25, or 26, 1964 (weather permitting)

11. Have you read label and directions for use of the pesticide you will use? Yes.

COAST OYSTER COMPANY

Richard K. Murakami
Signature - Wash. Div. Manager

June 15, 1964
Date

Shellfish Form No. 72

C
O
P
Y

WIEGARDT BROTHERS

Growers, Packers and Distributors of

PACIFIC OYSTERS

Canned - Smoked - Stews

Ocean Park, Washington
Phone: 643-8271

November 13, 1964

Mr. J. Richards Nelson
The F. Mansfield & Sons Co.
610 Quinnipiac Avenue
New Haven 13, Connecticut

Dear Mr. Nelsen:

I appreciated talking with you yesterday afternoon. I'm sorry that it was not possible to discuss motual problems at greater length.

The last two summers controlled applications of Sevin, for the control of shrimp, have been made by various companies on the Pacific Coast. The success has been from moderate to excellent. All spraying of Sevin has been done by helicopter under the supervision of a biologist. The Sevin is applied at the rate of 10 pounds active per acre. Some limited work has been done with the granular type. Each type, wettable, spray and granular, has its place.

Our State has been very cooperative in assisting in small experiments and supervising, or observing, the larger applications. Through this joint effort, there has not been any scientific, public health or public relations problems. I think the program has been handled in such a manner by our responsible agencies that all parties are aware of the potential.

You are speaking for the industry at the Sanitation Work Shop and I am happy to hear that you are in accordance with our attitude. We feel the use of nonpersistent and low residual pesticides has become an important part of our economic survival. The State of Washington has a program that has assisted us. We wish to see nothing in the manual that will destroy this.

My personal preference is that this be left out of the manual. Work is still at an experimental level and has not reached major proportions. Let us hope public health will not get involved.

Sincerely yours,

/s/

Lee J. Wiegardt
Wiegardt Brothers, Inc.

C
O
P
Y

SOUTH JERSEY SHELLFISHERMAN'S ASSOCIATION

P. O. BOX 275

ABSECON, NEW JERSEY 08201

November 9, 1964

To: Mr. Richard Loring
Box 597
Dennis, Massachusetts

Dear Mr. Loring:

In answer to your letter of October 29, about discussion of depuration in Washington, we understand that there is absolutely nothing sure about how any of the known processes of depuration will work on hard clams or that it would solve any of the problems with hard clams.

It is therefore our feeling that we could not back any serious plans for this here until such a time as we are shown that this would solve the problem or a large part of it.

In our area, we feel that our efforts are much better utilized by working for abatement of pollution, at least for the present time.

We are, however, much interested in any and all information which is available about depuration. We are also interested in backing any attempt to obtain funds for further study of depuration of hard clams.

We intend to petition our State and U.S. legislators, as a matter of fact, for additional monies for Rutgers University for these studies.

This just about sums up our feelings on depuration.

We hope to meet you in Washington next week.

Very truly,

/s/

Richard Crema, Sec.

cc:
Mrs. Elizabeth Wallace

C
O
P
Y

FIRE ISLAND FISHERIES, INC.

9 DEGNON BOULEVARD

BAY SHORE, L.I., N. Y.

November 5, 1964

Mrs. Elizabeth Wallace, Director
Oyster Institute of North America
22 Main Street
Sayville, N. Y.

Dear Libby:

After consideration of your communication recently in re depuration, we would like to stand and be counted. We do have some definite views on the matter.

As we understand your letter, it seems that two alternatives are being presented to us, neither of which is at all desirable. Our attitude is that if we have to choose between two evils we should choose neither. We should continue to press for a more effective implementation of the present set up.

Choice No. 1 which was presented was to conform entirely with the PHS demands for complete depuration. This presents so many more problems than it solves as to make it undesirable not only from our viewpoint, but also that of PHS unless it is really their desire to put us completely out of business. We would face the problem of handling a product which has been processed to the point that it is undesirable to our customers. We would face the problem of the increased cost. We would face the problem of confining the flow of this natural resource to those who have the substantial capital required to set up and operate a depuration plant. We would face the problem of the research costs of determining the process needed to insure the sanitary level demanded. The ironical part of all these problems is that they would be faced in order to cleanse a clean product. For, the fact is that the bulk of the clams available from the waters of New York State are in areas which meet the requirements.

After all these problems are faced, the present problem of bootlegging contaminated clams would yet be with us; and then on an increased scale. In fact, aside from the health aspect, contaminated clams might indeed present a more appetizing appearance, and at a cheaper price, than purified clams. Also there would be the probability of bootlegging clams from safe areas by by-passing depuration. This, it seems to me, is a problem PHS, or the States, would find undesirable.

Choice No. 2, if I understand it correctly, is a partial plan to cover by depuration shellfish taken from unsafe areas. The only desirable aspect of this, aside from the possibility that it takes the pressure off producers of shellfish from approved areas, is that it might reclaim resources which are not now safe. The question here is whether or not it is worth the effort, and whether it would not introduce a competition of a poor product against a good product.

Our information on the state of development of the depuration process at present is that it has been applied to soft-shell clams with some success, to oysters with limited success, but not yet with any success to hard clams. This means that we have no evidence at present that the entire depuration plan is feasible at all for hard clams. We have heard that the New York State Conservation Department is preparing to set up a depuration plant for hard clams to see what can be done, but until there is some indication that such a process is feasible, we stand opposed to committing ourselves to moving in that direction at all.

As for more effective implementation of the present setup, may we present the following two suggestions. Since the problem of contaminated clams arises through the ignorance or greed of a very small minority, would it not be well for the presently established organizations such as the Long Island Shellfish Farmers, local baymen's associations, et.al, to conduct an educational campaign which would strike at the grass roots. I have in mind the mailing of literature to every holder of a shellfish permit which would alert him and impress upon him the threat which exists to the entire industry because some foolish individuals cannot resist the temptation of forbidden fruit. Emphasis might better be placed upon the penalty to the entire enterprise if the culprit is successful in making a few dollars, than the penalty to be paid if he is caught. Having come up from the ranks of the lowly clam digger, and now having received the information from our contacts with other shellfish farmers as to the actual health hazards and threats to the entire industry, we believe the need exists for enlightenment of every possible taker of shellfish.

Our second suggestion is probably far out. This is for on-the-spot analysis of every batch of clams taken from the water. It's a tremendous thought because it is now already so difficult to police the restricted areas; what would it be for all areas? And it is now such a large job for the Conservation Department to make spot-checks and analyses; what a large job it would be for such a thorough certification. This suggestion seems ridiculous even to us, but it seems to be on a scale with depuration itself, so we insert it.

Trusting we have not misunderstood the problems, nor muddled the solution, we are

Sincerely yours,

FIRE ISLAND FISHERIES, INC.

/s/

Nelson Slager, Secretary

APPENDIX BB

INDUSTRY VIEWPOINT OF THE USE OF CHEMICALS ON OR NEAR SHELLFISH GROWING AREAS

By

George H. Vanderborgh, Jr.
G. Vanderborgh & Son
Box 94
West Sayville, New York

The need for chemicals is evident when we realize that 99% of oyster set is destroyed by natural enemies. With the high cost of seed from ponds - $12.50 per bushel - we cannot afford to lose seed to drills. For years land farmers have used chemicals to control natural enemies. In order for marine farmers to succeed, we will have to do the same. For the past twenty years, we have been trying in a similar way to control starfish with chemicals. Five years ago, the chemical "Drillex" was discovered to have a controlling effect on drills by research conducted at the Bureau of Commercial Fisheries Laboratory in Milford, Connecticut. Our company, under the rigid supervision of the New York State Conservation Department and the Fish and Wildlife Service, has worked with Drillex for the past three years on a commercial scale. The results have been gratifying.

Controlled tests showed 80% mortality in hatchery set on natural growing grounds, but only 10% mortality in set on chemically treated areas, with 50 samples being taken from each area. Two years after having been treated, one lot showed only 5% reinvasion of oyster drills.

The clam set on these same areas was 50% less on the treated area than on the control area. This would point out that this chemical should only be used on grounds on which seed oysters are to be planted. Since most of the drill damage is done in the first year of the oyster's life, oysters should be removed from the treated area after one year and placed in other growing beds. This would mean that oysters would grow another three years on untreated ground.

Chemicals should only be used with scientific farming methods and constant observation by skin divers. Drillex, while controlling drills, also controls other snails which normally serve as de-silters. As a result, silting accumulates more readily on the bottom.

A four-point program is recommended:

1. Continued field research on Drillex as to its effect on all marine life.

2. Rigid State controls and surveillance should continue.

3. Chemicals should only be used with scientific farming methods.

4. At present, Drillex should only be used on seed growing areas.

When used in this way, there is no public health factor involved.

USE OF CHEMICALS ON OR NEAR SHELLFISH GROWING AREAS--THE PUBLIC HEALTH SERVICE VIEWPOINT

By

Herman F. Kraybill, Ph.D.
Bureau of State Services
Public Health Service

Environmental pollution from agricultural chemicals can result from the unrestrained widespread application of highly toxic, often broad spectrum and stable chemicals in homes, gardens, farms, orchards, range lands and forests. In addition, the promiscuous dumping of industrial, agricultural and domestic pollutants has had its impact on water quality in our major waterways, lakes, bays and ground water supplies. The wide scale use of synthetic organic pesticides causing harmful effects, if not destruction of fish and wildlife, has aroused much interest as to its implications relative to human health. For example, if there is pollution in soil, this may become pollution in water which in turn becomes pollution in fish or domestic animals and ultimately at the end of the food chain results as chemical residues in the adipose tissue and certain target organs of the body of man.

Pesticides are as ubiquitous as fallout radionuclides, and there are no environmental media, air, water, milk, soils, and diet, that do not show positive levels of these environmental chemicals. This is particularly true since modern instrumentation and chemical methodology can detect near the molecular level at .001 micrograms (.001 ppm) in some substances and in raw and finished water supplies at parts per billion and parts per trillion level.

Undoubtedly, the problem of concentration of pesticides in plankton, fish and shellfish, the last being great concentrators of pesticides, focused attention on the need for corrective measures in application of these chemicals in estuarine waters and near shellfish growing areas. Many illustrations could be given but the observations made in the Willapa Bay area in Washington in 1963 have shown the effect of aerial spraying of DDT for hemlock looper control on the concomitant increase of DDT levels in Pacific Coast oysters. The Federal Pest Control Review Board, now the Federal Committee on Pest Control, recommended that the U.S. Forest Service substitute the less persistent "Sevin" for the highly persistent DDT. Apparently, Sevin does not affect as high a percentage control of the hemlock looper but it does obviate the residue problem in shellfish. (1)

Shellfish like other aquatic organisms are quite sensitive to pesticide chemicals, and in Table 1 is shown the effect of the low concentration (0.1 ppm) of various organochlorine insecticides on the growth of mature oysters after seven days of exposure. Endrin which is quite toxic to fish has the lower order of growth retardation than other chlorinated hydrocarbon compounds with the common insecticide DDT being the most toxic to mature oysters. The concentration of these seven pesticides would not have such an acute response on higher forms of animal life including man. (2)

Butler et.al. (3) have shown the effect of water quality on the ultimate residues of DDT in oysters and clams (Table 2). By allowing DDT contaminated clams and oysters to remain in clean water up to 90 days, these investigators noted a decrease from 151 ppm of DDT in oysters at zero days to 6.5 ppm of DDT after leaching at the end of 90 days. Clams showed a similar leaching effect and after 20 days in clean water there was a 96 percent reduction in the DDT content.

Assays for chlorinated hydrocarbons in shellfish have been made by various laboratories at certain locations and some positive levels of these persistent pesticides have been recorded in oysters, clams and shrimp. In Table 3 some values for heptachlor epoxide, dieldrin, DDE and the ortho para and para para prime isomers of DDT are shown with the isomers of DDT showing the higher residues in oysters and shrimp.

The Food Chemistry Laboratory, Milk and Food Research, Sanitary Engineering Center, Cincinnati, Ohio, in cooperation with the Shellfish Sanitation Branch have analyzed a spectrum of shellfish in 1963 and 1964 at various locations. (Table 4) The highest value for DDT plus DDE in shellfish was recorded at Mobile, Alabama at 0.900 ppm and a low value of less than 0.008 ppm at Willapa Bay, Washington. The latter value may reflect a cessation in the aerial spraying of DDT on forests near Willapa Bay through a controlled program. Certainly where the values are high this focuses attention on the need for corrective measures such as restriction of aerial spraying near shellfish growing areas or replacement of less persistent pesticides for the more persistent compounds. Further control measures may be indicated if water pollution surveys show extensive agricultural runoff or excessive dumping of pesticides into waterways.

While the data in Table 4 shows some geographical distribution in sampling, there is a much greater degree of sampling and assays made which are not yet summarized. In Table 5, for example, are shown some data on assays of oysters, water, mud, fish and shrimp and canned oysters conducted by the Gulf Coast Shellfish Sanitation Research Center in relation to the Mississippi River Fish Kill Study.

At the request of local conservationists, and after consultation with appropriate State and local authorities, a one year sampling--analysis study was conducted in Rhode Island to determine the movement, uptake, and retention of DDT in shellfish during a community aerial and ground spraying operation for mosquito control. Sixty-five samples of the Soft Shell Clam (*Mya arenaria*), and thirty-seven samples of the Northern Quahaug (*Mercenaria mercenaria*), were collected during the period May 9, 1963 to May 22, 1964 from waters in the northern Narragansett Bay areas contiguous with mosquito spray-control areas. The shellfish were shucked, frozen, and analyzed for DDT by gas chromatography by the Food Chemistry Laboratory at the Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. The maximum increases were from 0.28 to 1.34 ppm total DDT (total of DDT + DDE + TDE) for soft clams and from 0.12 to 0.22 ppm total DDT for hard clams. Measurable levels of dieldrin were found in hard shell clams. (4) Obviously the DDT levels found in shellfish in these studies are below the FDA residue tolerance of 7.0 ppm total DDT on fresh fruits and vegetables. However, one needs to assess these pesticide levels in terms of the additive effect of these shellfish pesticide levels to the total intake from other foods containing pesticides.

Various Federal and State agencies are collaborating in environmental surveillance of pesticides to establish residue levels and the trends of this pollution. Many of these compounds remain unaltered, such as the chlorinated hydrocarbons in animal and plant tissue retaining their initial toxicity, and others like the organic phosphorus compounds are rapidly degraded or metabolized in the animal or man and may have less persistence and toxicity at environmental levels. To illustrate the movement of pesticides through the environment, about 5 lbs. of dieldrin applied per acre resulted in 0.10 to 0.13 ppm of this compound in runoff water from a test field. Interestingly enough, this dieldrin level is about one tenth of the lethal dose for some fish and happens to be the level present in adipose tissue of people in the United States. (5)

As undesirable as residue levels in shellfish are, they do serve as criteria of water quality and indicate the influence of pesticide control operations and effect of aerial spraying or runoff. As part of the "biological food chain" shellfish concentrate pesticides from the aquatic environment. Similarly animal products concentrate pesticides and serve as reservoirs of persistent pesticides. Meat, eggs and shellfish contribute about 60 percent of the total level of chlorinated hydrocarbons in man's daily diet. Hence, through ingestion of these foods man has a continuous intake of pesticides which ultimately deposit in his body fat and certain target organs.

It is difficult to evaluate sublethal effects of pesticides, but the literature is replete with data on the acute toxic responses and lethal effects of high level occupational exposure to pesticides or other environmental chemicals. Of equal public health concern is the potential health hazard from low level exposure or the subthreshold toxic effect of these chemicals which may have a subtle action or latency period in long-term induction of chronic disease. An important concept to keep in mind is that if a substance does not demonstrate a harmful acute toxic effect, it cannot be concluded that such chemicals may not have a harmful effect through their micro insult at the cellular level. The Public Health Service is currently mounting comprehensive epidemiological studies in selected locations in this country to assess the long-term effect of such exposure to pesticides, either of a major or minor stress in terms of induction of disease.

Work with experimental animals has demonstrated that environmental chemicals at low concentration can alter cellular constituents such as DNA and it is now recognized that mutagenic, carcinogenic response and other patho-physiological aberrations may be initiated through this basic insult at the cellular level. (6)

Increasing testing on shellfish have shown in general that the levels of pesticides in shellfish are low particularly where control procedures have now been implemented. From a public health viewpoint, however, one must reexamine and reevaluate the current practices in the use of pesticides or other environmental chemicals which contribute to chemical residues in the food chain. Certainly, any decision to permit use of various chemicals in shellfish growing areas or other food growing areas must be resolved so that permissible use will involve a low order of risk. This can be achieved by developing at the State level a committee similar to the Federal Committee on Pest Control representing the various State agencies concerned with use and control of pesticides. An important function of this coordinating committee would be to establish constant surveillance of pesticides in the environmental media. Such vigilance in monitoring will help to demonstrate the trends in pesticide levels and establish the movement of these chemicals into the food chain and ultimately to man.

Table 1

Percentage Decrease in Growth of Mature Oysters after 7 days Exposure to 0.1 ppm of Various Pesticides (Compared to Controls of Zero Percent)

Pesticide	Percent
Endrin	51
Chlordane	55
Toxaphene	64
Dieldrin	66
Heptachlor	83
Aldrin	95
DDT and DDE	100

Data of USDI Fish and Wildlife Service (1960)
Bureau of Sport Fisheries and Wildlife
Circular 143 1962

Table 2

Effect of Leaching in Clean Water on Original Contamination of Oysters and Clams with DDT

	Residue of DDT in Shellfish	
Days in Clean Water	Oysters PPM	Clams PPM
0	151	3.5
10	128	0.88
20	---	0.16
30	119	---
50	44	---
90	6.5	---

Butler et al (1963)
USDI, BSFW

Table 3

Insecticide Content of Some Shellfish
October 1963

Location	Heptachlor Epoxide	DDE	O-P DDT	Dieldrin	P-P DDT
			Oysters		
		(Levels in PPM)			
Tomales Bay, Calif.	< 0.02	< 0.02	< 0.1	< 0.02	0.1
Sheldon, Wash.	< 0.02	< 0.02	< 0.1	< 0.02	< 0.1
			Shrimp		
Bodega Bay, Calif.	< 0.02	< 0.02	< 0.1	< 0.02	< 0.1

Data of Shell Chemical Company
Agricultural Chemicals Division
New York, N.Y. (Oct. 1963)

Table 4

Chlorinated Hydrocarbons in Shellfish

Geographic Location	DDE + DDT (PPM)
Mobile, Ala.	.900
Spindle Light, Md.	.130
Biloxi, Miss.	.070
Broadcreek, Md.	.060
Sarasota Bay, Fla.	.040
New Orleans, La.	.036
Houston, Texas	.020
Willapa Bay, Wash.	<.008

Data of USPHS, August 1964
Div. of Env. Eng. & Food Protection

GULF COAST SHELLFISH SANITATION RESEARCH CENTER
MISSISSIPPI RIVER FISH KILL STUDY

TABLE 5.--SUMMARY OF ANALYSES OF SAMPLES FOR CHLORINATED PESTICIDES*

Type of sample	No. samples examined	No. samples positive for pesticides	Pesticide content (PPM)					
			DDT and/or DDE	Aldrin	Endrin	Dieldrin	Lindane	Heptachl
Oyster (Raw)	43	18	(18^z)0.01 - 0.04	(1)0.01	(4)0.01	(5)0.01		
Water	26	5	(4)0.001 - 0.002				(1)0.02	
Mud	21	6	(6) 0.01 - 0.05					
Fish & Shrimp	6	4	(4) 0.01 - 0.04					(1)0.01
Canned Oyster	15	15	(13) 0.01 - 0.02		(12)0.01-0.08	(10)0.01-0.04		
Total	111	48						

*Only positive findings of pesticides in samples reported in this table.

^{z}Figures in parentheses indicate number of samples positive for pesticide shown.

References

1. Chemical and Engineering News, "Big Spray Projects to Use New Pesticides." 41. No. 25. 29. (1963)

2. Bureau of Sport Fisheries and Wildlife, Fish and Wildlife Service, U.S. Department of Interior. Effects of Pesticides on Fish and Wildlife, A Review of Investigations During 1960." Circular 143. (1962)

3. Butler, P. A., Lower, J. I., and Wilson, A. J. Uptake and Retention of DDT by Shellfish. Abstract of paper at National Shellfish Association Meeting. Bureau of Comm. Fisheries. Biol. Lab. Report. July 1963.

4. Fetter, J. W., and Schafer, Mary L., Rhode Island Insecticide Study--A pilot study on the uptake and retention of DDT in shellfish during a community study. Unpubl. Report. Shellfish Sanitation Branch, Div. of Env. Eng. and Food Protection, Bureau of State Services, U.S. Public Health Service. 1964.

5. Dale, W. E., and Quimby, G. E. Chlorinated Insecticides in the Body Fat of People in the United States. Science 142, 593-595 (1963)

6. Kraybill, H. F., Pesticides in the Balance: Benefit or Risk. Proc. Wash. State Hort. Assoc. 59 77-86 (1963)

APPENDIX DD

ATTENDANCE AT 1964 SHELLFISH SANITATION WORKSHOP

Mr. George W. Allen
Chief, Division of Seafoods
State of Alabama
Dauphin Island, Alabama

Mr. F. H. Allhands, Jr.
Division of Field Operations
Food and Drug Administration
DHEW
Washington, D.C.

Mr. Howard A. Anderson
Food and Drug Officer
Food and Drug Administration
DHEW
Washington, D.C.

Mr. Akira Ando
Chief, Public Health Section
Health Department
Hiroshima Prefecture Government
#1, Moto-machi
Hiroshima City, Japan

Mr. M. Arai
Japan Productivity Center
1001 Connecticut Avenue, N.W.
Washington, D.C.

Mr. W. Eric Ashton
Hooker Chemical Corporation
Buffalo Avenue
Niagara Falls, New York 14302

Mr. H. R. Bassett
Chesapeake Seafood Packers Assn.
1316 Woodland Road
Salisbury, Maryland

Mr. Robert N. Beck
Chief, Food Technology Division
D.C. Dept. of Public Health
401 3rd. Street, N.W.
Washington, D.C.

Mr. Richard E. Bellis
New Jersey State Department of Health
65 Prospect Street
Trenton, New Jersey

Mr. Quentin R. Bennett
Marine Fisheries Sanitarian
Shellfisheries Management Unit
New York State Conservation Department
Oakdale, New York 11769

Lt. Colonel Lorenz L. Beuschel
Chief, Food Inspection Policy Br.
Office of Asst. for Veterinary
Services
Office of the Surgeon General, DA
Main Navy Building
Washington, D.C. 20315

Mr. William Birch
Assistant Manager
William C. Bunting Oyster Co.
Box 5
Chincoteague, Virginia 23336

Mr. Thomas P. Blair
Shellfish Program Supervisor
Oregon State Board of Health
1400 S.W. Fifth Avenue
Portland, Oregon

Mr. H. Lee Boatwright, Jr.
President
Oyster Growers & Dealers Assn. of Va.
Lancaster, Virginia

Mr. C. W. Bohrer
National Canners Assn.
1133 20th St., N.W.
Washington, D.C. 20026

Mr. Ronald M. Bond
Chief of Inspection
Department of Fisheries of Canada
Sir Charles Tupper Building
Ottawa 8, Ontario, Canada

Mr. Mario Boschetti
Massachusetts State Dept. of
Public Health
546 State House
Boston, Massachusetts

Mr. Bob O. Bower
Pacific Coast Oyster Growers Assn.
Route 1, Box 123
Olympia, Washington 98502

Mr. J. Paul Bowers
Chief, Interstate Carrier Program
DHEW, PHS
1114 Commerce Street
Dallas, Texas 75202

Mr. Edward F. Bradley
Shellfish Consultant
DHEW, PHS
700 E. Jefferson Street
Charlottesville, Virginia

Mr. C. S. Brinsfield
Chief, Division of Food Control
Maryland State Department of Health
301 West Preston Street
Baltimore, Maryland 21200

Mr. J. C. Brooks
J. M. Clayton Company
Commerce Street
Cambridge, Maryland 21613

Mr. Robert M. Brown
Chief, Bureau of Environmental Hygiene
Maryland State Department of Health
301 West Preston Street
Baltimore, Maryland 21200

Mr. J. H. Bunting
Manager, Quality Control
Campbell Soup Company
375 Memorial Avenue
Camden, New Jersey

Mr. Hugh F. Butner
Section Chief
Sanitary Bacteriology
Florida State Board of Health
P. O. Box 210
Jacksonville, Florida 32201

Dr. Victor L. Cabelli
Associate Director for Research
Northeast Shellfish Research Center
DHEW, PHS
Narragansett, Rhode Island

Mr. E. L. Cheatum
Assistant Commissioner
New York State Conservation Dept.
State Campus
Albany, New York

S/Sgt. Harley G. Caldwell
Office of the Attending Veterinarian
USA Dispensary Pentagon
Washington, D.C.

Mr. N. McK. Caldwell
Supervisor, Milk & Shellfish Sanitation
North Carolina State Board of Health
Caswell Square
Raleigh, North Carolina 27602

Mr. David L. Calkins
Division of Air Pollution
DHEW, PHS
Washington, D.C. 20201

Mr. Manuel Canario, Jr.
Marine Biologist
Dept. of Agriculture & Conservation
Rhode Island Division of Fish & Game
83 Park Street
Providence, Rhode Island

Mr. James W. Carpenter, Jr.
Shellfish Sanitation Consultant
DHEW, PHS
1114 Commerce Street
Dallas, Texas 75202

Mr. Russell Ceurvels
Plant Director
Shellfish Purification Plant
Plum Island
Newburyport, Massachusetts

Colonel Ralph D. Chadwick
Veterinarian, Military District
of Washington
U.S. Army Dispensary (7004)
Room R24, Concourse, Pentagon
Washington, D.C. 20310

Captain Harold K. Chandler
Microbiologist
U.S. Army Natick Laboratories
Kansas Street
Natick, Massachusetts

Mr. John David Clem
Shellfish Sanitation Consultant
DHEW, PHS
50 Trinity Street, N.E.
Atlanta, Georgia

Mr. Stanley S. Copp
Regional Engineer
Department of National Health
& Welfare
605 - 1110 W. Georgia Street
Vancouver, B.C., Canada

Mr. Charles E. Cook
Director, Div. of Special Services
Bureau of Sanitary Engineering
Florida State Board of Health
P. O. Box 210
Jacksonville, Florida

Mr. Stanley Cottrell
William Cottrell & Sons
N. Harbor Road
Waretown, New Jersey

Mr. Richard Crema
South Jersey Shellfisherman's Assn.
P. O. Box 275
Absecon, New Jersey 08201

Mrs. Barbara Crema
South Jersey Shellfisherman's Assn.
P. O. Box 275
Absecon, New Jersey 08201

Mr. Clarence Cuyler
Chief, Operations Section
Div. of Water Supply & Pollution
Control
DHEW, PHS
Washington, D.C. 20201

Mr. Joseph A. D'Alfonso
Louisiana State Board of Health
P. O. Box 60630
New Orleans, Louisiana 70160

Mr. William J. Demoran
Mississippi Marine Conservation Comm.
P. O. Box 218
Ocean Springs, Mississippi

Mr. Robert L. Doxsee
President
Long Island Sea Clam Corp.
Point Lookout, New Jersey

Mr. Roy E. Drinnan
Fisheries Research Board of Canada
Biological Sub-station
Ellerslie, P.E.I., Canada

Mr. W. R. Edmonds
Chief, Public Health Engineering Div.
Dept. of National Health & Welfare
R. 318, 45 Spencer Street
Ottawa, Ontario, Canada

Mr. James B. Engle
Chief, Shellfish Advisory Service
U.S. Bureau of Commercial Fisheries
Oxford, Maryland

Mr. Earl H. Fayard, Commissioner
Mississippi Marine Conservation Comm.
P. O. Box 218
Ocean Springs, Mississippi

Colonel H. R. Faust
Commander, 2nd U.S. Army Veterinary Unit
Fort Meade, Maryland 20755

Mr. William A. Felsing, Jr.
Shellfish Sanitation Consultant
DHEW, PHS
50 Fulton Street
San Francisco, California

Dr. S. Y. Feng
Department of Oyster Culture
Rutgers University
New Brunswick, New Jersey

Mr. Frank E. Fisher
Director, Div. of Food & Drugs
Indiana State Board of Health
1330 West Michigan Street
Indianapolis, Indiana 40207

Mr. Lawrence H. Fisher
Sanitary Engineer Director
10908 Clermont Avenue
Garrett Park, Maryland 20766

Mr. Al Fletcher
State Sanitary Engineer
New Jersey State Dept. of Health
129 East Hanover Street
Trenton, New Jersey 08625

Mr. William Galegar
Arkansas Red River Project
Div. of Water Supply & Pollution
Control
DHEW
1114 Commerce Street
Dallas, Texas

Mr. Warren E. Gilbertson
Executive Officer, Division of
Environmental Engineering &
Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. Wesley E. Gilbertson, Chief
Division of Environmental Engineering
and Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. Larry Gillespie
Florida Board of Conservation
Marine Laboratory
Bayboro Harbor, P. O. Drawer F
St. Petersburg, Florida

Mr. John Girard
Advisory Sanitarian
Washington State Dept. of Health
Public Health Bldg.
Olympia, Washington

Mr. Phillip Goggins
Marine Resource Scientist
Maine Department of Sea & Shore
Fisheries
Augusta, Maine

Miss Linda Gordon
Div. of Water Supply & Pollution
Control
Enforcement Branch
DHEW, PHS
Washington, D.C. 20201

Mr. Richard S. Green
Chief, Basic Data Branch
Division of Water Supply & Pollution
Control
DHEW, PHS
Washington, D.C. 20201

Mr. R. H. Gregory
Virginia State Department of Health
1314 E. Grace Street
Richmond, Virginia 23219

Mr. Frank Grice
Division of Marine Fisheries
Department of National Resources
15 Ashburton Place
Boston, Massachusetts

Mr. Edward J. Gruble, Vice-President
Hilton Seafoods Company, Inc.
1437 Elliott Avenue, West
Seattle, Washington 98119

Mr. Richard J. Hammerstrom, Director
Gulf Coast Shellfish Research Center
Public Health Service
P. O. Box 158
Dauphin Island, Alabama

Mr. William A. Hansell, Director
Engineering-Sanitation Service
Georgia Department of Public Health
Atlanta, Georgia 30334

Mr. Harry Hanson
Associate Chief for Environmental
Health, Assistant Surgeon General
DHEW, BSS, PHS
Washington, D.C. 20201

Mr. William A. Haines, Jr.
Zone Veterinarian, Zone 1
2nd U.S. Army Veterinary Unit
Room 707, Calvert Bldg.
Baltimore, Maryland 21202

Mr. James E. Hanks
U.S. Bureau of Commercial Fisheries
Biological Laboratory
Cottage Street, Fort Trumbull Beach
Milford, Connecticut 06460

Mr. George Harrison
Executive Director
Chesapeake Bay Seafood Industries Assn.
Easton, Maryland 21601

Mr. Charles J. Hart
Interstate Carrier Branch
Division of Environmental Engineering
and Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. Harold H. Haskin
Professor of Zoology
Rutgers University
New Brunswick, New Jersey

Mr. Shozaburo Hirabayashi
Director, Hiroshima Branch
Nichiro Fisheries Co., Ltd.
1589-3, Eba-machi
Hiroshima City, Japan

Mr. Lewis F. Hobbs
Seafood Sanitarian
Maryland State Department of Health
301 West Preston Street
Baltimore, Maryland

Mr. Edgar H. Hollis
Chief, Fish and Crab Management
Maryland Dept. Chesapeake Bay Affairs
State Office Building
Annapolis, Maryland

Dr. Andreas Holmsen
Associate Professor
University of Rhode Island
Kingston, Rhode Island

Mr. John A. Hope
Shellfish Bacteriologist
Virginia St. Department of Health
5721 Seliger Drive
Norfolk, Virginia 23502

Mr. Malcolm C. Hope
Assistant Chief
Div. of Environmental Engineering
and Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. Leroy S. Houser, Chief
Standards Development Section
Shellfish Sanitation Branch, DEEFP
DHEW, PHS
Washington, D.C. 20201

Mr. Richard B. Howell
Consulting Sanitarian
Division of Sanitary Engineering
State Board of Health
Federal and Water Streets
Dover, Delaware 19901

Dr. Fred Hubbard
Program Development Officer
Division of Water Supply and
Pollution Control
DHEW, PHS
Washington, D.C. 20201

Mr. Henry A. Hults
Seabrook Shrimp and Oyster Co.
Seabrook, Texas

Dr. Robert F. Hutton
Division of Marine Fisheries
Department of Natural Resources
15 Ashburton Place
Boston, Massachusetts

Mr. Eugene T. Jensen
Chief, Shellfish Sanitation Branch
Division of Environmental Engineering
and Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. Dudley J. Johnson
Chief, General Sanitation Program
Texas State Department of Health
1100 West 49th Street
Austin, Texas 78756

Mr. C. B. Kelly
Chief, Research & Investigations Section
Shellfish Sanitation Branch, DEEFP
DHEW, PHS
Washington, D.C. 20201

Mr. Thomas E. Kennedy
Coordinator
The Board of Chosen Freeholders
Ocean County
Toms River, New Jersey

Mr. Vernon E. Keys
Division of Special Services
Florida State Board of Health
P. O. Box 210
Jacksonville, Florida

1st. Lt. Vernon W. Kimble
Asst. Attending Veterinarian
Office of the Attending Veterinarian
Fort Myer, Virginia

Mr. Herbert F. Klein
Division of Radiological Health
DHEW, PHS
1901 Chapman Avenue
Rockville, Maryland

Mr. M. Kobayashi
Nozaki Associates, Inc.
4 Albany Street
New York, New York

Dr. Herman F. Kraybill
Program Pesticide Officer
Office of Bureau Chief
DHEW, PHS
Washington, D.C. 20201

Mr. Alec Kritini
Chief, Health Information & Education
Division of Environmental Engineering
and Food Protection
DHEW, PHS
Washington, D.C. 20201

Mr. David Kronick
Chief, Milk and Food Section
Pennsylvania Department of Public Health
500 S. Broad Street
Philadelphia, Pennsylvania

Mr. Peter C. Kuh
Chief, Interstate Enforcement Section
Division of Water Supply &
Pollution Control
DHEW, PHS
Washington, D.C. 20201

Dr. J. Perry Lane
Bureau of Commercial Fisheries
Emerson Avenue
Gloucester, Massachusetts 01930

Mr. John A. Lavan
Budget Examiner
Division of Finance
Public Health Service
DHEW
Washington, D.C. 20201

Mr. Donald W. Lear
Aquatic Biologist
Division of Water Supply &
Pollution Control
Chesapeake Field Station
DHEW, PHS
Annapolis, Maryland

Mr. Allen G. Leary
Division of Radiological Health
DHEW, PHS
1901 Chapman Avenue
Rockville, Maryland

Mr. Terrance R. Leary
Coordinator, Coastal Fisheries
Texas Parks & Wildlife Department
Austin, Texas

Mr. William J. Lehman
Allen Kirkpatrick Company
Box E
Rehoboth, Delaware

Mr. Melvin Light
Division of Water Supply &
Pollution Control
Chesapeake Field Station
DHEW, PHS
Annapolis, Maryland

Mr. Robert V. Link
Sales Manager
Independent Can Company
900 S. Lakewood Avenue
Baltimore, Maryland

Mr. Richard H. Loring
Aquacultural Research Corp.
P. O. Box 597
Dennis, Massachusetts

Mrs. Dora D. Lore
Secretary-Treasurer
G. I. Rupert Lore & Sons, Inc.
Ridge, Maryland

Mr. G. I. Rupert Lore
President, G. I. Rupert Lore
& Sons, Inc.
Ridge, Maryland

Miss Rosanne Light
Program Analyst
Enforcement Branch
Division of Water Supply &
Pollution Control
PHS, DHEW
Washington, D.C. 20201

Dr. Warren Litsky
Commonwealth Professor
University of Massachusetts
Marshall Hall
Amherst, Massachusetts 01003

Mr. Butler T. Lower
Ludlam Avenue
Boyville, New York

Mr. Ronald G. Macomber
Associate Director for Field
Investigations
Northeast Shellfish Research Center
Public Health Service, DHEW
Davisville, Rhode Island

Mr. Harris Magnusson
National Fisheries Institute, Inc.
1614 - 20th Street, N.W.
Washington, D.C. 20009

Mr. Carleton A. Maine, Chief
Division of Water Pollution Control
Rhode Island Department of Health
335 State Office Building
Providence, Rhode Island

Mr. Howard L. Mallowes, Jr.
Vice-President
Mallowes & Sons, Inc.
Marion, Massachusetts

Mr. Alexander J. Mallos
Food and Drug Officer
Food and Drug Administration
DHEW
Washington, D.C. 20201

Mr. Richard S. Mark, Chief
Interstate Carrier Branch
Division of Environmental Engineering
and Food Protection
PHS, DHEW
Washington, D.C. 20201

Mr. R. H. Mears
Savage & Mears
119 Cleveland Street
Chincoteague, Virginia

Mr. Chan Meredith
Annapolis Field Office
Chesapeake Susquehanna Project
Div. of Water Supply & Pollution Control
DHEW
261 West Street
Annapolis, Maryland

Mr. E. C. Meredith
Director
Division of Engineering
State Department of Health
Bank & Governor Streets
Richmond, Virginia 23219

Mr. Hugh H. Mercer
Bluepoints Company, Inc.
West Sayville, New York

Mr. William C. Miller
Assistant Chief
Milk and Food Branch, DEEFP
BSS, PHS, DHEW
Washington, D.C. 20201

Mr. William O. Mills
Administrative Assistant
Congressman Rogers C. B. Morton
H.O.B. Room 319
Washington, D.C.

Mr. Bent Mogelberg, President
Mogelberg Foods, Inc.
80 East 11th Street
New York, New York 10002

Mr. William B. Moorer
Mississippi State Board of Health
P. O. Box 328
Gulfport, Mississippi

Mr. Cranston Morgan
W. F. Morgan & Sons, Inc.
Weems, Virginia

Mr. George Morrison
Shellfish Sanitation Consultant
PHS, DHEW
42 Broadway
New York, New York

Dr. James W. Mosley
Chief, Hepatitis Surveillance Unit
Communicable Disease Center
1600 Clifton Road, N.E.
Atlanta, Georgia 30333

Mr. T. J. Mucha
Food and Drug Officer
Food and Drug Administration
DHEW
Washington, D.C. 20201

Dr. Nelson Marshall
Professor of Oceanography
University of Rhode Island
Kingston, Rhode Island

Mr. William P. Murray
Maryland Health Department
Princess Anne, Maryland 21853

Mr. Rudolph L. McCormack
South Carolina State Board of Health
Ridgeland, South Carolina 29936

Mr. T. D. McGinnis
Virginia Seafoods, Inc.
Irvington, Virginia

Dr. Thomas R. McGowan
Director of Public Health
Alaska Department of Health & Welfare
Alaska Office Building
Juneau, Alaska

Mr. Arthur B. McIntyre
Officer-In-Charge
Shellfish Training Activities
Robert A. Taft Sanitary Engineering
Center, PHS
4676 Columbia Parkway
Cincinnati, Ohio 45226

Mr. R. J. McNeill
Assistant Chief, Inspection Branch
Department of Fisheries
P. O. Box 550
Halifax, Nova Scotia, Canada

Mr. Douglas McNicol, Secretary
Fire Island Sea Clam Company
Atlantic Avenue
West Sayville, New York

Mr. J. Richards Nelson, Treasurer
F. Mansfield & Sons Co.
610 Quinnipiac Avenue
New Haven, Connecticut 06513

Dr. Arthur F. Novak
Professor and Chairman
Dept. of Food Science & Technology
Louisiana State University
Baton Rouge, Louisiana 70803

Mr. Charles P. Orr
Food and Drug Officer
Food and Drug Administration
DHEW
Washington, D.C. 20201

Mr. John M. Parsons
South Green Street
Tuckerton, New Jersey

Mr. James C. Pearson, Director
Office of Federal-State Relations
Food and Drug Administration, DHEW
Washington, D.C. 20201

Mr. Johnny Peres, Jr.
Shellfish Producers
P. O. Box 36
Seabrook, Texas

Mr. George O. Pierce
Chief, Bureau of Food and Drugs
D.C. Department of Public Health
401 - 3rd Street, N.W.
Washington, D.C. 20001

Mr. Joseph Pileggi, Chief
Fishery Market News Service
U.S. Bureau of Commercial Fisheries
1815 N. Fort Myer Drive
Room 510
Arlington, Virginia 22209

Mr. Cornelius Pollion
Long Island Fisherman's Assn.
Westhampton Beach, New York

Mr. Somers B. Pringle
Chief of Shellfish Section
South Carolina St. Bd. of Health
P. O. Box 408
Beaufort, South Carolina 29903

Mr. James R. Redman
Bacteriologist
New York State Dept. of Conservation
Oakdale, New York

Mr. Frederick H. Richardson
Blount Seafood Corporation
383 Water Street
Warren, Rhode Island 02885

Mr. Chris H. Riley
Department of Conservation
Division of Shell Fisheries
John Fitch Plaza Labor Building
Trenton, New Jersey 08625

Mr. J. W. Robbins
Maryland State Health Dept.
Gay Street
Cambridge, Maryland

Mr. Harold B. Robinson
Chief, Research Grants Branch
Div. of Environmental Engineering
and Food Protection
DHEW
Woodmont Building
Bethesda, Maryland

Mr. Howard Ronan
Information Officer
Division of Environmental Engineering
and Food Protection
PHS, DHEW
Washington, D.C.

Dr. Shaun J. Ruddy
Hepatitis Surveillance Unit
Communicable Disease Center
1600 Clifton Road, N.E.
Atlanta, Georgia

Mr. J. K. Rulon
Hogate's Sea Food Restaurants
Main Avenue & 9th Streets, S.W.
Washington, D.C. 20024

Mr. Edwin L. Ruppert
Chief, Milk and Food Branch
Division of Environmental Engineering
and Food Protection
PHS, DHEW
Washington, D.C. 20201

Dr. Ralph T. Russell
Gulf Coast Shellfish Research Center
Box 158
PHS, DHEW
Dauphin Island, Alabama

Mr. A. C. Salinger
Maryland State Department of Health
16 East 23rd Street
Baltimore, Maryland 21218

Mr. Bryan Bruce Salley
Shellfish Sanitation Consultant, DEEFP
PHS, DHEW
700 East Jefferson Drive
Charlottesville, Virginia

Mr. Albert E. Sanderson, Jr.
Maryland Department of Water Resources
State Office Building
Annapolis, Maryland

Mr. Hugh Sarraf
Chief, Food Section
Pennsylvania State Health Department
Health and Welfare Building
Harrisburg, Pennsylvania

Mr. Fred Schieferstein
Huntington Bayman's Association
527 Adams Street
Centerport, New York 11721

Captain Richard L. Schumacher
Office of the Attending Veterinarian
Fort Myer, Virginia

Mr. David C. Schwinabart
Anne Arundel County Health Department
Annapolis, Maryland

Mrs. Lucy Seligson
Division of Water Supply &
Pollution Control
PHS, DHEW
Washington, D.C. 20201

Mr. Walton K. Sharpe
Canadian Department of National
Health & Welfare
P. O. Box 608
Truro, Nova Scotia, Canada

Mr. LeVega R. Shelton, Jr.
Bacteriologist
Food and Drug Administration
DHEW
Washington, D.C. 20204

Dr. Carl N. Shuster, Director
Northeast Shellfish Research Center
Public Health Service, DHEW
Narragansett, Rhode Island 02882

Mr. Fred W. Sieling
Department of Chesapeake Bay Affairs
State Office Building
Annapolis, Maryland

Mr. James Silva, Chief
Field Operations Section
Shellfish Sanitation Branch, DEEFP
PHS, DHEW
Washington, D.C. 20201

Mr. John J. Singleton
Food and Drug Officer
Food and Drug Administration
DHEW
Washington, D.C. 20204

Mr. Walter L. Smith
Associate Professor
Suffolk County Community College
College Road
Selden, Long Island, New York

Mr. O. A. Spady
Assistant Manager
Battery Park Fish & Oyster Co.
Battery Park, Virginia

Dr. Albert K. Sparks, Professor
University of Washington
College of Fisheries
Seattle, Washington 98105

Mr. Leo St. Michel
Acting Regional Program Director
Div. of Water Supply &
Pollution Control
PHS, DHEW
120 Boylston Street
Boston, Massachusetts

Dr. Maynard A. Steinberg
Assistant Laboratory Director
Bureau of Commercial Fisheries
Emerson Avenue
Gloucester, Massachusetts

Dr. Alan D. Stevens
Research Grants Branch
Division of Environmental Engineering
and Food Protection
PHS, DHEW
Woodmont Building
Bethesda, Maryland

Mr. Dalton K. Stratton, Secretary
Blount Seafood Corporation
383 Water Street
Warren, Rhode Island 02885

Lt. Earl O. Strimple
Assistant Attending Veterinarian
Office of Attending Veterinarian
Fort Myer, Virginia 22211

Mr. Louis D. Stringer
Acting Chief
Branch of Shellfisheries
Bureau of Commercial Fisheries
Department of Interior
Washington, D.C. 20240

Mr. M. C. Tatro
University of Maryland
Box 351
Crisfield, Maryland

Dr. A. D. Tennant
Bacteriologist
Laboratory of Hygiene
Department of National Health
& Welfare
Ottawa, Ontario, Canada

Mr. Ivy R. Todd, Jr.
Todd Seafoods, Inc.
Cambridge, Maryland

Mr. Calvert B. Tolley
Owner
Meredith & Meredith
Wingate, Maryland

Mr. John Torpey
Florida State Board of Conservation
Marine Laboratory
Bayboro Harbor, P. O. Drawer F
St. Petersburg, Florida

Mr. John E. Trygg, Director
Division of Public Health Engineering
Louisiana State Board of Health
325 Loyola Avenue
New Orleans, Louisiana 70160

Mr. George Vanderborgh, Jr.,
Manager
G. Vanderborgh & Son
Box 94
West Sayville, New York

Mr. Ralph VanDerwerker
Regional Program Director, DEEFP
PHS, DHEW
42 Broadway
New York, New York

Mr. Dick Vaughan
Route 1
Leander, Texas

Mr. Dana E. Wallace
Marine Resources Scientist
Department of Sea and Shore Fisheries
State Office Building
Augusta, Maine 04330

Mr. David Wallace
Director of Marine Fisheries
Division of Fish and Game
New York State Conservation Dept.
Oakdale, New York 11769

Mrs. Elizabeth M. Wallace, Director
Oyster Institute of North America
22 Main Street
Sayville, Long Island, New York

Miss Regina R. Wasileski
Program Management Officer
Shellfish Sanitation Branch, DEEFP
PHS, DHEW
Washington, D.C. 20201

Mr. Albert W. Webb
Maryland Health Dept.
Bay Street
Cambridge, Maryland

Mr. James A. Westbrook
Regional Program Director, DEEFP
PHS, DHEW
621 Seventeenth Street
Denver, Colorado 80202

Mr. C. W. Wiley, Supervisor
Virginia State Health Dept.
Bureau of Shellfish Sanitation
Richmond, Virginia

Mr. Theodore C. Willerford
Principal Sanitary Engineer
State Department of Health
79 Elm Street
Hartford, Connecticut

Mr. A. V. Williams
Oyster Farmer
Box 5045
Baltimore, Maryland

Mr. Jeanean Wingo
511 S. 3rd Street
La Porte, Texas

Mr. Edward F. M. Wong
Shellfish Sanitation Consultant,DEEFP
PHS, DHEW
120 Boylston Street
Boston, Massachusetts 02116

Mr. William Woodfield, Partner
Woodfield Fish and Oyster Co.
Galesville, Maryland

☆ U.S. GOVERNMENT PRINTING OFFICE : 1965 O - 755-030

DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
PUBLIC HEALTH SERVICE

REGIONAL OFFICES

REGION I - Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont

120 Boylston Street
Boston, Massachusetts 02116

REGION II- Delaware, New Jersey, New York, Pennsylvania

Room 1200, 42 Broadway
New York, New York 10004

REGION III- District of Columbia, Kentucky, Maryland, North Carolina, Virginia, West Virginia, Puerto Rico, Virgin Islands

700 East Jefferson Street
Charlottesville, Virginia 22901

REGION IV - Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee

Room 404
50 Seventh Street, N. E.
Atlanta, Georgia 30323

REGION V - Illinois, Indiana, Michigan, Ohio, Wisconsin

Room 712 New Post Office Bldg.
433 West Van Buren Street
Chicago, Illinois 60607

REGION VI - Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota

560 Westport Road
Kansas City, Missouri 64111

REGION VII - Arkansas, Louisiana, New Mexico, Oklahoma, Texas

Ninth Floor
1114 Commerce Street
Dallas, Texas 75202

REGION VIII- Colorado, Idaho, Montana, Utah, Wyoming

Room 9017, Federal Office Building
19th and Stout Streets
Denver, Colorado 80202

REGION IX - Alaska, Arizona, Calofornia, Hawaii, Nevada, Oregon, Washington, Guam, American Samoa

50 Fulton Street
Civic Center
San Francisco, California 94102